The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. III. NOVEMBER 27, 1920 No. 76

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- abroad. Cheques, P.O.O.'s, and Postal Orders should be made payable to Benn Brothers, Ltd.

Editorial & General Offices—8, *Bouverie Street, London, E.C.4.*
Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines)

A Special Number

TO-DAY'S issue of THE CHEMICAL AGE takes the form of a special number. It is the first of a series of such numbers dealing with specialised subjects which it is intended to issue at regular intervals; and although our first attempt in this direction is naturally on a more or less modest scale, our readers will probably welcome the inauguration of a policy which enables us to present in collective form information relating to the most recent developments in one particular branch of the industry. America, perhaps, is the home of special issues, and many of our readers are, no doubt, familiar with the admirable, if unwieldy, numbers which make their appearance over there on all special occasions. It must be understood, however, that such monumental publications are, in these days of soaring costs of production, something of a luxury, and they are usually confined to the old-established periodicals. We, on the other hand, are still young, and are well content with our growth, thanks to as loyal a band of supporters as any new journal ever had. We are sorry to disappoint the prophets who confidently predicted, and arranged for our early demise. Their attitude now takes the more flattering form of attempting, with rather indifferent success, to imitate us.

The subject of special scientific and analytical instruments which is dealt with in this issue should, by reason of the fact that attention has only been given to apparatus of recognised ability, prove of special interest to those who are considering the more scientific operation of the plant which is under their care. A good deal is heard to-day of scientific management, and the control of processes by recognised technical supervision rather than by archaic rule-of-thumb methods, and if waste is to be prevented there can be no question that the first cost of apparatus which will detect it is insignificant in comparison with the monetary saving which such apparatus must eventually effect. The development of automatic analytical and recording apparatus has been particularly noteworthy during the past few years; and so long as the average workman continues to be fitful and erratic in carrying out his duties so long must those in authority provide themselves with safeguards against unnecessary disturbance or neglect.

The Dyestuffs Muddle

THE Government cannot be congratulated on the way in which they are handling the dyestuffs problem. Long ago they came to a definite decision on the question of establishing a British industry, and offered certain pledges of support over a period long enough to give the industry a fair chance of making itself self-dependent. On the strength of those pledges vast sums of money have been invested in the enterprise and, in spite of admitted imperfections, considerable progress has been made. The Government have announced that their policy of protecting this nascent industry is to take the form of the prohibition of imports, subject to a licensing system. Now they state that the Bill for making this provision cannot be introduced this year. In the meantime the Sankey judgment has destroyed the fictitious authority on which the Government formerly regulated imports. As a result German chemicals and dyestuffs are coming in freely at prices considerably lower than the cost of production here. Without accepting all the alarmist statements on the subject, the position has serious aspects. Yet the Government simply dilly-dally with the question and allow matters to drift. The situation is satisfactory neither to the manufacturer, nor to the merchant, nor to the consumer.

That the manufacturers in particular are deeply concerned is clearly shown by the grave tone of the speeches at the Chemical Industry Club dinner last week. The argument was that unless the Government act promptly, not only the new dyestuffs industry,

but British chemical industry as a whole may be killed. Further, if Germany is permitted to destroy the chemical industry, it will be in a position later to do as much for the textile and other industries dependent on dyestuffs. Perhaps this is putting the case in rather too alarmist a fashion. It attributes to Germany too miraculous a power of recovery and gives too little credit to British ability to hold its own wherever it chooses to make the necessary effort. The magnificent organisations of such firms as Brunner, Mond & Co., and Lever Brothers are themselves a proof that artificial protection is not necessary to the existence of British industry. All the same our dyestuff manufacturers have a real grievance and the Government, if they play with the question much longer, must expect trouble.

Their delay in taking action has enabled the whole controversy of Free Trade v. Protection to be revived with great vigour. The dyestuffs question has become once more a central question in politics. Sir Robert Horne's policy is feeble and vacillating in that while he delays the introduction of his promised measure he also declines to call together in conference the three interests more immediately concerned. While recognising the manufacturers' strong case for Government action, remedial action would be made far easier if the interests of manufacturer, merchant and consumer could be mutually accommodated. If the three sections most directly concerned could be brought to agree on a common line of policy for safeguarding the British chemical industry the Government could be compelled to do what is required, and Sir Robert Horne seems to us to have missed an opportunity in not trying for, or indeed insisting on, a friendly interchange of views between them. The manufacturers, with merchants and consumers conciliated and working in alliance with them, would be in a stronger position than ever.

Chemistry's Social Centre

THE second annual dinner of the Chemical Industry Club, reported in this issue, was one of the jolliest and most successful functions one can recall in connection with chemical industry. The almost ecclesiastical atmosphere of the Tallow Chandlers' Hall, in which the dinner was held last year, favoured a spirit of reverence, rather than of hilarity. In the freer atmosphere of the Connaught Rooms the guests found it easy to unbend, and they had done so very thoroughly long before the pleasant evening came to an end. The speaking was uncommonly keen and interesting. It illustrated a point we have more than once mentioned in connection with chemical gatherings. The vocation of chemistry is so exclusive and introspective that when chemists meet together too often they only find themselves in a larger laboratory, and fall to talking chemical "shop" in the formulæ which so largely constitutes the chemists' vulgar tongue. This is pleasant enough to those who serve within the temple and understand its rites, but it has one disadvantage. It has no public side. It takes no account of the outside aspect of things. The result is that chemistry, though interwoven with every branch of industrial enterprise, is perhaps the least known and the least appreciated of all the sciences. On the other hand, when chemistry finds a spokesman who can interpret its work in the terms of public life, it suddenly acquires a new interest and importance.

It was fortunate in this respect on this occasion. In Lord Moulton, Sir William Pope, Mr. W. J. U. Woolcock, M.P., and Dr. Forster it had representatives not only familiar with the internal interests of chemistry, but conscious of its vital bearing on national interests. The policy they dealt with is discussed elsewhere. Here it is enough to say that they offered a presentation of chemistry's relation to national life which excited the keenest interest. The attention never flagged for a moment, and instead of being bored by the usual technical lectures, more suitable to the classroom than to the banqueting-hall, most of the guests were too engrossed in the discussion to notice the passage of time. It was a delightful evening and a most encouraging experiment. The Club, encouraged by such an experience, might well risk the organisation —provided they do not come too often—of similar discussions on questions that fall half-way between the technical and the political. It was the manufacturer's point of view that was almost exclusively emphasised on this occasion. On some other evening it might be profitable to attempt a synthesis of the views of manufacturer, distributor, and consumer, with representative experts of each. The Club has already made a definite place for itself, and on the social side can render services which no other institution can do quite so well.

The Brunner Mond Decision

THE decision on the question whether Brunner, Mond & Co. were entitled to vote a sum of £100,000 in aid of scientific research was awaited with great interest, and the High Court decision in favour of the company's policy has been received with general satisfaction. We are not quite sure whether the refusal to grant an injunction finally disposes of the matter. It is to be hoped that it does. Usually where an injunction is applied for and the case argued on affidavits it is left for the judge to say whether it is necessary to call further evidence. In this case the judge decided against the application for an injunction, and, that being so, the shareholder's objection is presumably disposed of, unless the point is taken to the Appeal Court. Legally, of course, any shareholder is entitled to challenge an act which he holds to be outside the terms of the articles and memorandum of association. If every shareholder did this whenever a company trespassed the least bit beyond the strictly defined limits, we should have innumerable applications for injunctions. Fortunately the common sense and the public spirit of the shareholders prevents this, and companies are allowed to vote funds to many worthy causes because the people entitled to object approve the objects aimed at, and do not raise capricious objections.

If judgment in this case had gone in favour of the applicant it might have had a very serious effect in restricting the part public companies take in beneficent public work. Throughout the war generous donations were given to war funds and charity funds, many of which if challenged might have been held to be outside

the defined objects of the donor corporations, but such acts were fully sanctioned by the good sense and good feeling of the shareholders. Similarly, from time to time, registered associations or companies contribute to the support of educational and similar objects, which, if not technically within their articles, promote the public good and in the end indirectly benefit the associations themselves. Fortunately, in this case Brunner, Mond & Co.'s handsome benefaction in aid of scientific research was held to be at least within the spirit of their articles, and the efforts of the applicant to frustrate the admirable intentions of the directors were defeated. Where public bodies are moved by a generous public spirit it is highly desirable in the public interest that they should be allowed the fullest liberty of action, and the example of Brunner, Mond & Co. in this case was so commendable that it would have been extremely disappointing to find it rendered futile by want of legal sanction. Fortunately, the law in this case, so far as it has been determined, coincides with the public interest, and it is reasonable to expect in any such future cases that the courts will interpret companies' discretionary powers, when exercised for the public good, in the widest permissible sense.

The Danger of Fire Extinguishers

IT is by no means our intention to discourage the use of the various forms of fire extinguishers suitable for dealing with an outbreak in its incipient stages and thereby preventing in many cases a serious conflagration. On the contrary, we would emphasise that these appliances are not used on chemical works to the extent which they should be, but as they are gradually increasing in popularity, it is as well that those who look upon them as safety devices should thoroughly appreciate the dangers which some forms introduce. We refer in particular to the use of carbon tetrachloride for the purpose, and the fact that one or two fatal results have recently followed inhalation of the fumes evolved when fire extinguishers employing this compound have been put into operation.

An investigation of the decomposition products of carbon tetrachloride liquid has lately been conducted in America, two methods of experiment being followed. The first consisted in applying the liquids to actual fires and to hot metal in a closed room of 1,000 cubic feet capacity, where the gaseous products, mixed with the air, could be retained and analysed. The second method was to pass the vapours in air through heated tubes of iron or quartz, where humidity of the air and the temperature could be controlled. The results of the tests showed that poisonous gases were found in the atmosphere of the enclosed chamber. Of these, phosgene, which is intensely poisonous, was formed in toxic quantities. Chlorine, which is also poisonous, was formed in smaller amounts. Hydrogen chloride, which is irritating and also poisonous, was formed, and there was considerable vapour of carbon tetrachloride, which is a dangerous anæsthetic. The experiments with heated tubes corroborated the results found with actual fires. As a result of the experiments, it is recommended that carbon tetrachloride fire extinguishers should not be used on fires in closely confined spaces where conditions are such that the user cannot escape without breathing the fumes. The average user of a fire extinguisher certainly has little idea of the fact that the decomposition products may be of a poisonous nature; and, in order to avoid all risk of wrong application, it would seem imperative that all those types of extinguishers which introduce dangers of this kind should be plainly lettered, with a caution-plate stating that the fumes evolved must not be inhaled owing to their dangerous character.

Employment in Lead Processes

THE Bill relating to the employment of women and young persons in lead processes, which passed its second reading in the House of Lords last week, is, we believe, very far from satisfactory in its details to some who have examined it in the interests of chemical industry. Its provisions were adopted by its promoters in the House of Commons in rather too wholesale a fashion, and it is believed that an agreement has been come to for its amendment on the return to the Commons in several respects. Apart from the details of its provision, the Bill raises the much larger question whether measures of this character, dealing with highly technical and complicated questions should be drafted without consultation with bodies competent to advise from the point of view of industry. It is satisfactory to learn that action has been taken to correct some of the mistakes made, and later the matter may be in order for fuller discussion than is possible at the moment.

The Calendar

Nov. 29	Royal Society of Arts: First Cantor Lecture, "Micro-organisms and Some of their Industrial Uses," by A. C. Chapman. 8 p.m.	John Street, Adelphi, London.
30	Chemical Association: "The Chemical Tour, 1920," by F. Smithson. 4.30 p.m.	Royal College of Science, Dublin.
Dec. 2	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "Centrifugal Extractors and Separators Applied to the Chemical Industry," by Dr. J. Broadbent. 6.30 p.m.	Manchester.
3	Chemical Society: "The British Heritage of Science," by W. E. Frakenburg.	Royal College of Science, South Kensington, London.
3	Society of Chemical Industry (Manchester Section): "Beta-Trinitrotoluene and its derivatives," by R. Robinson and Dr. E. Cornall. 7 p.m.	Manchester.
4	Mining Institute of Scotland	Royal Technical College, Glasgow.
4	Institution of British Foundrymen: "Modern Metallurgical Investigation," by Dr. J. Brislee.	College of Technology, Manchester.
7	Hull Chemical and Engineering Society: "The Ricardo Engine," by T. S. Leggott. 7.30 p.m.	The Metropole, West Street, Hull.
29	Royal Society of Arts: First Cantor Lecture, "Micro-Organisms and some of their Industrial Uses," by A. C. Chapman	John St., Adelphi, London.

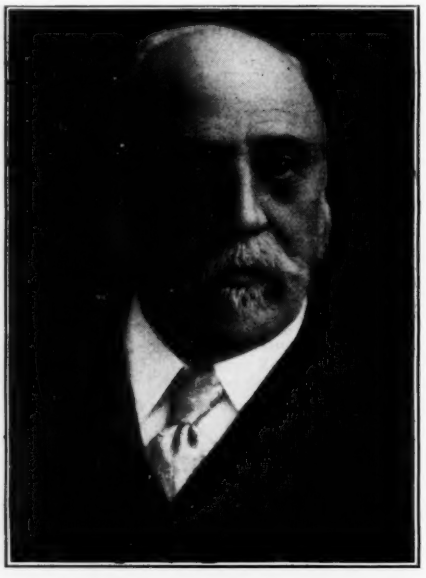
Chemical Industry Club's Second Annual Dinner

The Dyestuffs Problem and the German Menace

THE second annual dinner of the Chemical Industry Club was held at the Connaught Rooms, London, on Friday, November 19, Sir William Pope presiding. The principal guest was Lord Moulton, and among others who were present were Mr. W. J. Woolcock, M.P. (general manager of the Association of British Chemical Manufacturers), Mr. M. O. Forster, Dr. H. J. Johnson (Worshipful Master of the Tallow Chandlers Co.), Dr. W. R. Ormandy, Capt. C. J. Goodwin (Treasurer of the Club), Mr. B. F. Davies (hon. Sec.), Mr. E. V. Evans, Dr. Dehn, &c. Invitations had been sent to a number of others, some of whom were unable to accept owing to illness. Letters of regret were received from Sir Herbert Jackson, Sir James Dobbie, Sir John Brunner Mr. John Gray, Mr. Max Muspratt and others.

Lord Moulton

LORD MOULTON, proposing "The Profession and Industry of Chemistry," said he was honoured in having placed in his hands a toast which was not only one of the most acceptable to his own feelings, but one of the most admirably expressed



LORD MOULTON,
Who proposed "The Profession and Industry of Chemistry."

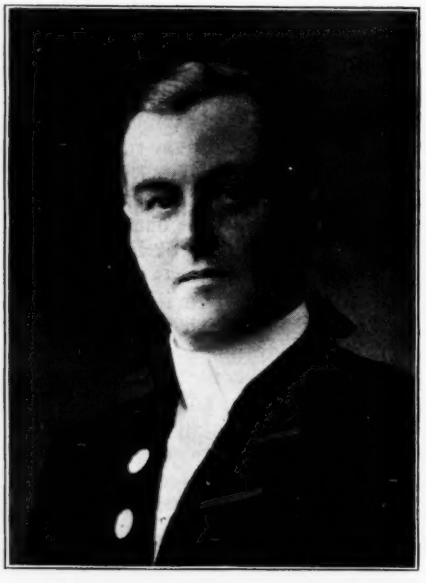
that he had ever known. Those who had framed it had apparently realised that the most valuable movement of public thought in recent years had been to destroy the chasm that used to be supposed to exist between the professional chemist and the chemical industry. The destruction of that line of separation, the brigning into close contact of the laboratory chemist, the master of research, the teacher of chemistry and those who made that chemistry available in the lives of the people of their country and of the world, was a step which, in his opinion, was only a commencement of the recognition of a really united industry.

Speaking first with regard to the profession of chemistry, he said that the professor of chemistry had taught us the wealth of the world in which we lived and the composition of the substances of which our growth was composed, and how we got from them the elements that were needed for our wants. The past history of the profession of chemistry was such that one could not help feeling proud of this profession.

The Need of Chemical Independence

Coming to the second part of the toast, which to him was as interesting and more profoundly engrossing at the present moment, namely, the industry of chemistry, he said that how much mankind owed to the practical application of the knowledge obtained by the chemical profession he could not describe. He had had very many opportunities, however, in the last few years of seeing the beneficent work of chemists, and the opportunely destructive work of chemists, and he could not refrain from saying a few words on that aspect. At the present moment we were at a crisis of our history, because if England did not realise that it must be a great chemical nation its future was gone. It needed like almost no other nation to make in large quantities the substances to satisfy the needs of the nation, and it also must realise that the moment might come when as a country it might stand alone and have to satisfy its own needs in moments of unmeasured trial.

We had passed through four years of that already. He did not suppose that any of them realised as he did the extent to



[*From a photograph taken in Court Dress.*]

MR. W. J. U. WOOLCOCK, M.P.
(General Manager of the A.B.C.M.), who replied.

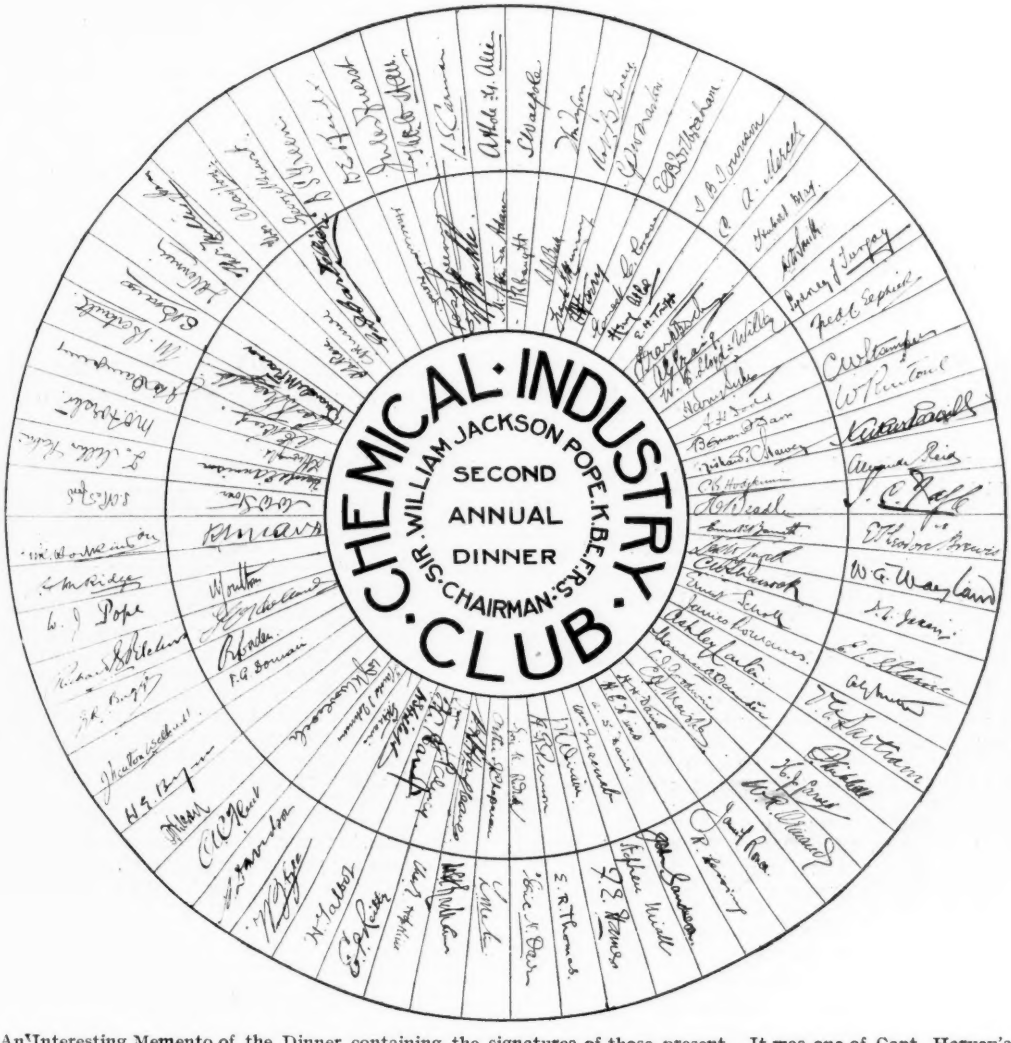
which we depended for the whole of our existence on matter that had to be brought many thousands of miles over oceans haunted by submarines, whilst the Germans, through their development of chemistry, were making nitrates in unlimited quantities at home. He never felt as he did then the necessity for a nation to place itself in the position of being able to secure its own wants if it were cut off from succour from outside, and he felt that the most important question of to-day was whether England would earnestly and successfully take to manufacturing nitrates from the atmosphere, both for the purposes of peace, when it needed fertilisers so largely, and for the purposes of war, when it must be able to get the destructive nitrates from its own manufactures. The matter was in strong hands, but he wanted them all to realise that it was not mere knowledge that was needed, but the existence of manufacturers capable, by reason of their size and the mastery which they had of the work and of bearing the full load that would be thrown upon their shoulders should war again befall us.

The Dyestuffs Question

There was another question of the day about which he felt quite as enthusiatic, and on which he wished to address them in just the same earnest tone. The dyemaker was engaged in an industry in which the plant was capable of being adapted to deal with the manufacture of the organic substances necessary in war. Moreover, the dye industry was one which had poured unmeasured wealth on our enemies, and it ought to be an equal source of wealth to us and make it possible for us equally to reap richly from all the nations of the world by the way in which we satisfied their needs for dyes. He was not speaking as a partisan, and he asked them to think whether there was any industry which had to make widely different compounds of an organic type that must have the plant necessary to do that, as did the dye industry. It was because they must possess that plant and the knowledge to work it that in his opinion it was, next to the ammonia industry, the most essential industry to be developed, both for peace and war, if our country was to maintain the position which it had hitherto held. He took these as specimens of the industry of chemistry which had been made possible by the profession of chemistry, and he asked them to drink most heartily to the prosperity of both the industry and the profession of chemistry.

Mr. W. J. U. Woolcock, M.P.

Mr. W. J. U. WOOLCOCK, M.P. (general manager of the Association of British Chemical Manufacturers) replying to the toast, said there had been a very striking example of the manner in which demands had been made to organise the chemical industry in this country. Some little time ago the learned societies came to his Association and asked what it was going to do with regard to research chemicals for British manufacturers and for British research workers. The Association said it would do anything which was possible if the professors would tell them the best way to do it. The professors subsequently produced a fairly long list—about 800 to 1,000—of inorganic substances which they said that research workers in this country really wanted and which were absolutely indispensable to them. The manufacturers said that these substances must be made in this country if it was at all possible, and such progress had been made that at the present time the manufacturers were prepared to provide about 600 of the substances that had been asked for.



An Interesting Memento of the Dinner containing the signatures of those present. It was one of Capt. Harvey's happy suggestions, and the original is being framed for preservation in the Club.

Professor and Industrialist

At the same time he wished to enter a plea for further co-operation between the professional side and the industrial side in this particular work. He knew it was very difficult for

a professor who, perhaps, was obliged to send across the water for some particular research chemical not to add to that list various other research chemicals, because he felt that his time was very valuable and he could not afford to take the extra trouble to divide his order in two and obtain those of them which he could from this country. In making that plea he would do all he possibly could, and he was even prepared to say that he would, if necessary, bully them into giving research workers in this country the chemicals which they required. It was this sort of team work, of which we learned a little during the war which had got to continue in an intensified form.

Chemical Plant Manufacture

He would like to turn from that to the question of chemical plant in this country. The position a few months ago was something like this. The makers of chemical plant in Great Britain were convinced that the outstanding scandal from their point of view was that the chemical manufacturer and the chemical engineer took no trouble whatever to ascertain what could be made in Great Britain or what was available, but went abroad for the chemical plant they required. That was the point of the chemical plant manufacturer, and there was something in it. The point of view of the chemical manufacturer here was that it was impossible to rely on British chemical plant, and what was wanted was not obtainable here. A little progress had been made since then, however. A few months ago there was formed the Association of British Chemical Plant Manufacturers, and he had that morning presided at a conference between them and the chemical manufacturers, who had sat round a table for three hours telling each other exactly what they wanted. It was the first time in the history of the British chemical industry that two sections of it had come together in this manner, and he hoped that that progress would long continue.

Dyestuffs and National Security

He would like to take up another point which had been referred to by Lord Moulton, namely, the dye industry, but to deal with it from another point of view—from the House of Commons point of view. We had reached a stage now when it was extremely necessary that we should begin to educate Members of the House of Commons. They must have noticed during the last two or three months that the public was taking a very great interest in the dye situation, and they could take it from him that any subject in which the public took an interest Members of Parliament also became interested in, because no medical man felt the pulse of his patient as carefully or as accurately as the Member of Parliament felt the pulse of the public. In the House of Commons there was not only a great legislative machine which solemnly went on grinding out day by day, but there were numerous groups of men, men who formed themselves into innumerable groups for the study of different subjects. In particular, there was the Commercial Committee, which was a fairly large body of men who took great interest in all commercial questions. The dye question had been before that particular Committee, and there was a thirst for knowledge which it was quite beyond his personal capacity to satisfy. Therefore, he wanted those of them who could to do all that was possible to satisfy that thirst whenever they had any opportunity.

The Demand for Protection

A point had now been reached when it was generally agreed that some form of protection, or, if they did not like the word "protection," some form of assistance, was essential to the dye industry and to the fine chemical industry. That was dawning on the public mind, but unfortunately at the moment the public was very much confused because the doctors who had been called in for the malady did not entirely agree. There were suggestions of subsidies and of tariffs, although what the figure of the tariff would have to be to deal with the present situation he did not know. One expert had told him that it would have to be about 300 per cent., which, of course, was a perfectly ridiculous suggestion. Then there had been the suggestion of a system of licencing, a very ingenious suggestion of free imports with a licence fee to be varied in accordance with the difference between the price at which German dyes were offered in this country and the price at which British manufacturers were willing and prepared to supply it. That was a movable tariff not at the will of the House of Commons or anybody with authority, but movable, apparently, at the sweet will, perhaps, of an advisory Committee consisting of representatives of traders and manufacturers.

When all these propositions were considered we were driven back to what, after all, was nothing more than the least of all the evils, and that was the licencing system with some of its defects cut away. There was a section of the textile industry which was not in agreement with this proposed system of licencing, but he would say quite deliberately that he believed the number of those in the textile industry who were not prepared to agree to that system had been very much exaggerated. He believed that industry was susceptible to demonstration, and he hoped that within the next few days it would be possible to demonstrate it. But they were in this position with regard to the Government. At the moment, owing to congestion of business in the House of Commons, it was impossible for anything except what was practically unopposed legislation to be added to what was already on the programme between now and Christmas, but the Prime Minister had said that if they could agree among themselves, so that a measure which would be unopposed could be brought in, he would reconsider the matter. It was not difficult to demonstrate to any impartial authority in this country or to any body of men, more especially was it not difficult to demonstrate it to Labour, who were willing to learn, that for the national safety it was absolutely essential that there should be established here a great chemical industry which would be the safeguard when we reached a point in national life where possibly navies and armies would not be the prime consideration in warfare.

Dr. M. O. Forster

Dr. M. O. FORSTER, F.R.S., proposed "The Chemical Industry Club." Speaking of the necessity for a strong chemical industry in this country, he said that no greater evidence of that could be desired than the fact that the Germans themselves had told the world that if they had not been able to manufacture nitric acid from atmospheric nitrogen the war would have been over in the middle of 1915. This emphasised the point that Lord Moulton had made, that the manufacture of nitric acid in this country must be established. Bearing upon this was the important question of whether we were to allow the Germans to re-establish their world monopoly of dye making, or whether we were really to have a serious dye making industry in this country. It was of enormous importance, not merely from the economic standpoint, but from the educational standpoint, because if there were no dye making industry in this country there would be no real incentive to the study of organic chemistry here, and there would be no outlet for the energies, brains and genius of our students of organic chemistry, and they would be unable to find employment.

The German Menace

There was, however, another feature, not merely educational, which should appeal to the public at large, and particularly to those textile users of dyes, whom, he understood from Mr. Woolcock, were the real snags in the situation. These opponents, whom Mr. Woolcock had said were not large in number, should be told quite frankly that they were cutting their own throats, because, assuming the dye making industry in this country were allowed to collapse, and he believed it would collapse very shortly if the Government did not bring in this Bill, Germany might re-establish its world monopoly of dye making, and it was then only a question of time before our textile industry itself was strangled.

When he said this to people the reply was, "Why did not the Germans strangle it prior to 1914?" The answer was a very simple one. The German textile industry was not ready then to strangle our textile industry, but as soon as it was the German dye makers could so raise prices against our British textile dye users that it would be practically impossible for a dyer in this country to put dyes on fabric. It seemed to him to follow absolutely logically, and the situation which would then arise was this, that the textile manufacturers would have to be content with making undyed yarns and fabrics. That meant absolute ruin of the textile industry in this country, and from a mere economic standpoint, from the textile manufacturers' own point of view, he would tell them, if he were in the fortunate situation of Mr. Woolcock as a member of the House of Commons, that they were simply cutting their own

throats if they opposed this Bill, and if they did not allow the Prime Minister to bring in before Christmas an unopposed Bill to deal with this situation. He said "before Christmas" for this reason: The public had not the least idea of what had been going on. It was getting late, but it was of such vital importance that he would like to tell them in a few words what had happened.

Effect of the Sankey Judgment

In July, 1919, when the British Dyestuffs Corporation was launched, the Government promised the prospective shareholders in that corporation that there should be for a period of ten years prohibition of German dyes, except under licence. In December, 1919, that decision was found to be illegal by the Sankey judgment. He believed it was found to be illegal because, up to that point, it had only been an Order in Council and not an Act of Parliament. Since December, 1919, absolutely nothing had been done to relieve the situation, and consequently German dyes had been pouring into this country. He was informed a few days ago—he believed quite credibly—that there were at the present moment in Liverpool warehouses 4½ million pounds' worth of German dyes, which had come in since that period. Before the war this country used only two million pounds worth of German dyes, and if they multiplied that by two for the change in values, it meant that there must be one year's consumption, pre-war consumption, of dyes in this country in these warehouses. How were the domestic dye making companies to make their way? It was absolutely impossible, and they were not making their way. Last week the British Dyestuffs Corporation had to dismiss 600 men, and the National Dyes Co., with three factories, had all these three factories closed down, and the whole dyemaking industry in this country was absolutely at a standstill, simply and solely because the Government had done nothing since 1919, when the Sankey judgment removed the embargo on German dyes. That, he believed, was the situation, and if Mr. Woolcock would only use his opportunities with those few textile manufacturers he would see to it that the Prime Minister brought in an unopposed Bill before Christmas.

In conclusion, referring to the Chemical Industry Club, he said it was hoped before long that the chemical industry would have a home of its own, one which would give accommodation for the very numerous chemical societies, and also offer facilities for a chemical club such as now existed in New York. Until that time came, however, the Chemical Industry Club was doing an immensely valuable service, and for that reason he felt proud and delighted to propose the toast of its success.

Sir William Pope

Sir WILLIAM POPE, in reply to the toast, said that the great interests, technical and scientific, of chemistry in this country had been well served by three large and very powerful chemical organisations, namely, the Chemical Society, the Society of Chemical Industry and the Institute of Chemistry, but until two years ago there had been no sort of organisation in this country which catered in any kind of way for the social instincts of the chemist, and he thought they could claim that the Chemical Industry Club ought to demand that every chemist of any standing in the country should endeavour to associate himself with it. During the two years that had elapsed since the inauguration of the Club, the membership had amounted to something over 700 members, and very comfortable premises had been acquired. The result of the past year's working had been to show a balance, and he ventured to think that there was practically no club in London, whether new or old, that during the past year had shown a balance to the good.

During the past few years the public had had a good lesson on the effect of neglecting chemical science and chemical industry, and in the effect of that neglect upon national prosperity. Nevertheless, that lesson had not produced the maximum effect which it was capable of conveying. Those who were acquainted with the teaching profession knew that it was insufficient merely to give a lesson. The teacher had to follow that lesson up, and that was what they would have to do with the public. It was no use saying that during the war the public had learned the value of chemistry. The country had not learned the value of chemistry. What it had learned was that a lesson had been given to it. It now had to learn that lesson, and it was the duty of the chemical industry as a whole to drive that lesson home. He could not help feeling that much of the disadvantage under which they as chemists believed they had suffered in the past was due entirely to their own lack of appreciation of what was needed in educating the public. They had been in the habit of laying their facts before the public, and not following them up. The chemical industry had three totally distinct aspects, namely, the scientific aspect, the technical aspect, and the social aspect. As regards the latter, the Chemical Industry Club was acting as an admirable link until such time as the larger scheme which Dr. Forster had referred to could be established.

Central Headquarters Scheme

They were all aware that a great appeal was being launched for funds with which to establish a chemical home, and for providing the facilities which were absolutely essential for the great publication schemes in connection with chemical literature which would have to be undertaken some time or other in the near future. Something like £500,000 would be required for launching these projects, and that appeal, which was at present being made privately, would, he had no doubt, very shortly be made publicly. They were very fortunate in that Lord Moulton, who probably more than anyone else in this Empire, had realised what the cultivation of chemical science and the chemical industry meant to the progress and, indeed, the very existence of our nation, was taking the lead in this appeal. When they reflected upon the magnitude of the capital involved in the chemical industries of the Empire he thought they would all realise that the sum of £500,000 was a ridiculously minute proportion of the financial interests involved, and it appeared to him that it devolved upon every member of the profession to do everything he possibly could to ensure that this appeal met with a proper reception, and that the money which was required should be found. He had noticed in the club room a motto which said: "If we do not all hang together we shall all hang separately," and that motto he commended to their favourable consideration.

Mr. W. R. HODGKINSON proposed the toast of "The Guests," which was responded to by Dr. RUSSELL (Rothamsted) and Dr. H. J. JOHNSON (Worshipful Master of the Tallow Chandlers Company).

The final toast of the evening was "The Chairman," proposed by Professor F. G. DONNAN.

Comparative Therm Tables

To simplify the many problems and to minimise the laborious calculations that confront gas managers and engineers under the Gas Regulation Act, the *Gas World* will shortly publish a concise volume "Comparative Therm Tables," by H. R. Askew. Part I includes tables for the conversion of therms to thousands, and vice versa, variations in therm prices corresponding to 1d. per thousand, &c., and some suggestions regarding the amount by which therm prices should be varied from time to time. The prices per therm corresponding to prices per thousand for every 1d. from 2s. to 7s. have been tabulated, and should be particularly useful in making comparisons on the old and the new basis. Part II shows the conversion of sliding scales to a therm basis, with some examples of their working. Part III discusses an alternative to a sliding scale which has been prominent recently, by which the benefits of a reduction in price are shared, in certain proportions, between the consumers and the shareholders. Its application to a typical undertaking is shown, and its effect compared with that of a sliding scale. For convenience of reference an appendix containing the Gas Regulation Act and the Board of Trade Regulations issued in connection with it, is included.

The price of "Comparative Therm Tables" is 5s. 6d. post free, and orders, which will be executed in strict rotation immediately the book is ready, are now being accepted by Benn Brothers, Book Department, 8, Bouverie Street, E.C.4.

The French Government will shortly submit to the Allied Governments a plan for the institution of an international patent council. It is proposed that Brussels should be a kind of "clearing house" for patents. Belgium, Brazil, Czecho-Slovakia, Poland, and Roumania have already given their consent to the scheme.

Roasting Furnaces for Sulphide Ores

By H. M. Ridge, M.E., M.Inst.M.M.

AN interesting lecture upon this subject was delivered by Mr. H. M. Ridge (The Ridge Roasting Furnace & Engineering Co., London) at the College of Technology, Manchester, on Thursday, October 11th, to a large audience.

Mr. Ridge stated that it was only of recent years that adequate attention had been given to the design and use of roasting furnaces, but antiquated plant was still in operation to a considerable extent. The tonnage gave some idea of the importance of the subject. In 1913, the last pre-war year for which figures were available, the world's production of the more important metals, mainly obtained from sulphide ores, were :—Copper, 1,005,900 metric tons ; lead, 1,186,700 metric tons ; spelter, 997,900 metric tons ; tin, 128,900 metric tons.

At least 12 million tons of copper ore were desulphurised in order to obtain the red metal. A considerable quantity of this was smelted, the sulphur being removed in the course of the smelting operation. A very large quantity of pyrites was burned in order to make sulphuric acid, and when the ore was cupriferous, the copper was afterwards recovered. Probably over 3½ million tons of pyrites were burned in 1913 for making acid.

Most of the lead was obtained from the treatment of sulphide ores, and presumably about 1.9 million tons of ore were roasted in 1913.

Spelter was formerly made entirely from calamine, but about the middle of the last century it became necessary to treat zinc blende, and he estimated that, at the present, 90 per cent. of the metal produced was obtained from the sulphide ore. This meant that in 1913 about 2¼ million tons of blende had to be roasted.

Tin was obtained from the oxide (cassiterite), but practically all the lode tin, and a good deal of the alluvial tin, was won in conjunction with varying amounts of other minerals carrying sulphur, and, frequently, some arsenic. These, and certain other elements, could not be completely removed in smelting, and it was necessary to eliminate them before the tin concentrate was reduced to metallic tin in the smelting furnace, because otherwise only an impure tin was obtained. He estimated that in 1913 about 100,000 tons of tin concentrates were roasted.

These figures indicated that some 20 million tons of these ores were roasted annually. If gold, nickel, and other ores and intermediate products were included, the tonnage would be still larger.

Theory of Roasting

The roasting of all ores, high in sulphur, was exothermic. In many cases special precautions were necessary to prevent the ore from melting, and a considerable quantity of heat had to be removed. Towards the end of the roasting operation it might become necessary, on the other hand, to supply heat because the oxidation of the last of the sulphur did not give off enough heat to maintain the process. Considerable difficulties had to be overcome in consequence of the big volume of air required to supply the necessary oxygen for oxidation, while the amount of air admitted ought always to be kept under close control to prevent excessive removal of heat. This was not sufficiently understood until recent years.

For oxidation the air must be brought into actual contact with the ore at the proper temperature, and, at the same time, fresh surfaces must be frequently exposed to gases with a sufficiency of oxygen and the gaseous products removed.

In the muffled zinc-blende roasting furnaces mainly used in Germany the fire gases passed under each of three hearths. It was necessary to supply heat to the bottom muffle, but when the fire gases passed under the middle muffle, their temperature was lower than that of the ore in the muffle where rapid oxidation took place. As a consequence, the fire gases in this part of the furnace were heated from the ore and the roasting operation was retarded by loss of heat.

A similar thing occurred in long level furnaces. Sulphur di-oxide was 2¼ times heavier than air. The heavy gas did not readily diffuse into the lighter air, and, unless it was removed, oxidation became impossible, because the ore was blanketed under a layer of inert gas. This action was very noticeable in big Hasenclever furnaces, but was appreciably less in the Delplace type. Gas samples taken close to the ore in a zinc-blende roaster gave 11 per cent. SO_2, while the gas under the arch had only about half of 1 per cent. At the same time, the exit gas from the top hearth averaged 5½ per cent. SO_2.

To illustrate the importance of correct design of roasting furnaces, Mr. Ridge quoted the results from a large plant erected 15 or 20 years ago in this country. The coal consumption, which had previously been 16-18 cwts. per ton of ore treated, dropped to 9 cwts. in the new plant. He was then called in, the furnaces were altered, and the coal consumption was reduced to about 100 lbs.

Roasting in Open Heaps

Roasting in open heaps was formerly practised to a large extent, but the removal of sulphur was always incomplete and the loss of metal considerable, while the sulphur fumes were allowed to pass out of the top of the heap only a few feet above the ground level, so that the atmosphere was polluted and all vegetation destroyed. This method had been used on copper and lead ores to obtain a preliminary partial roast. As an example, at Mansfield in Germany, the bituminous copper bearing shale used to be burned in open leaps prior to smelting, the bituminous matter and part of the sulphur being removed.

At Broken Hill this method was adopted to a considerable extent for roasting and sintering leady slimes, but the fumes were such a nuisance that the operation had to be carried out some miles away from the town, far from human habitation. The individual heaps contained 4,000 to 5,000 tons of slimes.

A modern pyrites lump burner was described into which the ore was fed by hand on to a grid of square iron bars, which could be turned with a lever in order to discharge the burned lumps into a hopper. The grate area of each of the eight sections was 21 sq. ft. The capacity of the furnace was 3 tons of pyrites per 24 hours. Air was admitted under the grate through small air ports with slides, and, to allow of easy regulation, cross walls were built so that the air supply to each section could be controlled. A strong gas at a high temperature was given off with regularity, and this could be easily maintained. If the fumes were to be used for making mononhydrate, or oleum, the air was dried before admission, so that no water passed into the furnace with the air. Where the chamber process was used, this precaution was unnecessary, and the iron plating of the furnace was not required. In most cases the ore was crushed before roasting.

Reverbatory furnaces, rabbled by hand, were in use in many works, and, with the aid of photographic illustrations, Mr. Ridge described a large single-hearth furnace as used for lead or copper ore. As shown, the furnace was about 60 ft. long, and the hearth 44 ft. long by 10 ft. wide. Given efficient labour good results were obtained, but as the work was most arduous, hand-rabbled reverbatories were now only built for temporary purposes or under special conditions. Such furnaces were wasteful in fuel and required an enormous amount of labour. The furnace arch was usually much too high, and a large volume of unnecessary air passed into the furnace and was heated.

Sulphur Fumes

In consequence of the effects of passing large quantities of sulphur fumes into the air efforts were made in Germany and Belgium to make a more concentrated gas from roasting zinc sulphide ore, and to avoid the dilution with the fire gases, so that the SO_2 could be used for making sulphuric acid. About 1855, Hasenclever built a partially-muffled furnace and tried to use the fumes given off on the upper hearth for making acid, while the last of the sulphur was drawn off in contact with the fire gases on the lower hearth. The arches were built too high, and the SO_2 contents of the fumes was low.

Godin constructed a muffled furnace for the same purpose in 1865. The results were better, but the output was small, and the concentration of the gas insufficient. This furnace showed a marked improvement, as the designer realised that extraneous heat was only necessary for the final oxidation.

To reduce the amount of hand labour Hasenclever and Helbig, in 1862, attempted [illegible] e an inclined plane for the first stage of the operation, followed by a horizontal muffled hearth, and then dropped the ore to a lower horizontal hearth in contact with the fire gases. Labour costs were not reduced because of irregularities with which the ore travelled down the incline, partly on account of the iron and lead, which caused caking, so that the accretions had to be barred down. The furnace produced about 3 tons of roasted ore per 24 hours, and six men, each working 12 hour shifts, were required so that the output [illegible] er man was only 10 cwts.

Types of Furnaces

In one of the first so-called Rhenania Furnaces for zinc blende, built in 1882, the fire gases travelled four times the length of the furnace, which had nine muffles, each 5 ft. 5½ in. wide, placed crosswise in the furnace, each of them extending over four hearths. The output of this furnace was 3 to 3½ tons of roasted ore with a coal consumption of 27 per cent., and the ore remained in the furnace for about 48 hours. The output per man per shift was about 14 cwts. In the case of a larger improved double-sided Rhenania furnace, 47½ ft. long by 17½ ft. wide the ore was stirred lengthwise in the furnace. Working eight-hour shifts six men were required, and the production per man per shift rose to 19 cwts. The coal consumption was 25 per cent., the ore remained in the furnace for 48 to 72 hours, and the gas carried usually 5½ per cent. SO_2.

The Delplace Furnace for zinc ore was introduced in Belgium about 1895, and was still the best hand furnace for the work. The ore travelled only 40 ft., but the arches were very low, so that 6½ per cent. SO_2 could be maintained in the gas. The coal consumption was about 16 per cent., and the work was rather more arduous than on the Rhenania furnaces.

Mr. Ridge then described the Ropp or Brown, furnace, with a mechanical stirring appliance, and which had been adopted in America; a Vieille Montagne (Belgium) furnace with mechanically stirred and hand rabbled hearths; the Hammond and Spence furnace (America), in which an effort had been made to adopt mechanical rabbling on a furnace with four hearths without any great success; the Mathiessen and Hegeler furnace, extensively used in America for zinc ore; the Brunton furnace, used in Cornwall for roasting pyritic middlings produced in the tin ore concentrating mills; the Godfrey furnace and the Herreshoff furnaces, which were the first of the modern mechanical burners for fines.

The Ridge Pyrites Burner

This was a burner which possessed the advantage of making gas high in SO_2, and was practically free from dust. Heated air passed on to the bottom hearth. The ore was fed continuously on to the top roasting hearth near the shaft on the left, and was stirred in a gradually increasing spiral until it reached the periphery of the rabbled zone, and then passed into the zone rabbled by a second shaft. Here it was stirred in a gradually decreasing spiral towards the centre, and passed on to the second hearth. The same travel of ore took place on this hearth, and also on the third, fourth and fifth hearths. From the latter it was discharged into a truck or conveyor. The rabbles which came into direct contact with the ore were the only wearing parts, being subject to abrasion. These had renewable feet which were easily and quickly replaced without delay to the furnace. The height between the hearths was small, and the gas space appreciably less than in other types. Owing to the straight line travel of the gases in the furnace, and the position where the ore dropped from one hearth to another, the gas left the furnace remarkably free from dust. The centre hearths of the furnace were cooled by means of small passages, and the air, which was pre-heated in this passage, passed continuously to the bottom hearth of the furnace, where hot air was required to oxidise the last of the sulphur. By this means the sulphur could be more completely removed than was possible in the older types of furnaces. Ordinary firebricks, and for the arches ordinary wedge bricks, were used, so that only a very few special bricks were necessary. The walls were made thick in order to avoid loss of heat. Dust loss was avoided, because the ore was fed into the furnace, where there was practically no travel of gas. The capacity was 15 tons pyrites fines in 24 hours for the large size, decreasing to 6 tons for the smallest size.

Ridge Direct-Fired Chloridising Furnace

This type was used for roasting tin concentrates. The ores usually carried some sulphur and arsenic, and sometimes antimony, lead, copper and bismuth. In order to produce high-grade metallic tin these substances had to be removed. The sulphur content of the roasted ore was under 0·1 per cent., while only a trace of arsenic or antimony remained. The lead, copper and bismuth were transformed into soluble salts and leached out before smelting. In this furnace a drying and pre-heating hearth was used, from which the ore passed automatically on to the top roasting hearth. To avoid loss of heat, the ore from the bottom roasting hearth dropped to a cooling hearth and pre-heated the air. The capactty of this furnace was 48 tons in 24 hours, with a coal consumption of only 15 cwts. per day.

Muffled Ridge Furnace

This type of furnace as used for roasting copper ore had a capacity of 35 tons a day. It was employed where complete removal of the sulphur was desired, and the bottom hearth was heated, while the fire gases left the furnace at a high temperature, and were used in a recuperator for pre-hating the air required for the furnace.

The Spirlet furnace was used for zinc ore, the newer designs having four hearths. With suitable ore they produced 3½ to 4½ tons of roasted ore per day; but the output rapidly decreased as the rabbles wore away. The alternate hearths rotated, and the ore was stirred by means of special bricks, which projected downwards from the arch above. Each furnace utilised 3¼ H.P. and 8 cwts. of coal per day. On the Continent one man per eight-hour shift looked after two furnaces, and during part of this time he was engaged in burning the hearths to prevent accretions. The gas was 5½ to 6½ per cent. SO_2. With the very best ore, the furnace had been kept at work for 10 months, but the presence of iron or lead shortened the campaign appreciably. For re-bricking, the hearths were removed bodily by an overhead traveller. It was found necessary to dry the ore before it was fed into the furnace to prevent the formation of lumps.

Dwight-Lloyd Furnace

An illustration was shown of two H.H. pots. Up to about 25 years ago lead concentrates had to be roasted in reverberatory furnaces and then briquetted. The H.H. process introduced a most important innovation, and consisted in partially roasting the ore, and then completing the operation in an iron kettle by blowing air through the charge. Considerable heat was developed by the oxidation of the sulphur, and the charge melted together in a solid mass, which, when broken, formed an ideal charge for the smelting furnace. The pots were used in different sizes up to 25 tons. The evolution of gas varied considerably during the operation, and the temperature was low, but in some works the fumes were used for making acid. The H.H. process materially reduced the metal loss and the working costs.

The Dwight-Lloyd roasting machine was used largely for the final desulphurisation of pre-roasted lead concentrates, yielding a porous, easily smelted sinter. The capacity of the machine was 75 to 130 tons of lead concentrates in 24 hours, and 40 to 50 gallons of heavy oil were required for the burner. The burner gas and the fumes were sucked downwards through a layer of ore on a travelling iron belt.

A Recent Development

The latest development in zinc ore roasting consisted of a simple Ridge furnace supplied with hot air for pre-heating the ore down to 6½ per cent. sulphur. The partially roasted ore passed on to a Dwight-Lloyd machine for final desulpheuisation. The total fuel consumption was reduced to about 6 per cent., while it had been found possible to reduce the sulphur content in the roasted ore to 1 per cent. total sulphur, which was an extraordinarily satisfactory figure.

Peter Brotherhood, Ltd., are makers of pressure gauge testing apparatus suitable for testing gauges from 20 to 6,000 lb. per square inch. Pressures are measured by weights applied either directly or by lever to a steel ram. The pressure on the ram is the same as that in the pressure gauge tube. No packing is fitted to the ram, which is, therefore, nearly frictionless.

The Manufacture of Neutral Sulphate of Ammonia

By E. V. Evans, O.B.E., F.I.C.

We give below the substance of a paper read by Mr. E. V. Evans, of the South Metropolitan Gas Co., at a conference in London on Tuesday, of the Southern Association of Gas Engineers & Managers.

THE problem of manufacturing from the ordinary gas works sulphate of ammonia a neutral salt with specific physical properties is not such a simple one as it would at first glance appear to be. In the case of the purification of an organic product such as indigo, salicylic acid or naphthol—products which are sold by the pound weight—an extra operation such as re-crystallisation or distillation does not materially affect the final selling price. Considering, however, that the pre-war selling price of sulphate of ammonia was of the order of 1¼d. per lb., and is now about 2d. to 2½d. per lb., there is limited scope for the application of refinements in the process. This problem has engaged the attention of numerous chemists during the past few years, and I need only mention the names of Adam, Capron, Linder, Lessing and Sheard to remind you of the many processes which have been devised for the production of a high quality sulphate of an acid-free nature and a low moisture content. These processes have been based upon the removal of the acid by means of washing the impure crystalline sulphate with a neutral or slightly alkaline solution of ammonium sulphate, or with water, or by mixing the crystalline sulphate with a fixed alkali or an alkaline carbonate, or by neutralising the acid by means of ammonia gas. I do not propose to deal with the details of any of these processes, but to suggest to prospective manufacturers of neutral sulphate that they should investigate the relative merits of these processes by actually inspecting, wherever possible, the plants in operation.

South Metropolitan Experiences

In the years before the war a large proportion of the sulphate of ammonia made by our Company was exported to the Continent and America; London being essentially an exporting centre. It had been our practice, therefore, to foster these markets and to maintain a close watch upon the developments of the synthetic trade of other countries. The technical success of the Haber synthetic ammonia process in Germany and the rapid development of this process by the Badische Anilin und Soda-Fabrik caused us no little concern, for it was evident that strating with such pure chemical re-agents as gaseous nitrogen and hydrogen and sulphuric acid manufactured by the contact process their final product would be of first quality. Our apprehensions were fully justified when in 1913 we first received a sample of the German synthetic product. It is quite neutral and practically free from moisture, and its mechanical properties as well as its colour are excellent. At that time we were manufacturing what was considered to be a good salt in this country—at least we were operating the same process as in 1918, when the Sulphate of Ammonia Association's Annual Report referred to the universal praise bestowed upon the salt supplied by our Company. I do not quote this in any boastful spirit, but rather to emphasise the fact that the German salt in 1913 was vastly superior to our product which was considered in this country to be a high quality salt. This fact was further impressed upon us when we received in common with other sulphate manufacturers a letter from an American firm which emphasised the marked inferiority of British sulphate as compared with the German product and proceeded to advise us that, unless immediate steps were taken to improve our product, we should awaken one day to find that we had lost the American trade that we had been endeavouring for a number of years to build up. These unfavourable comments, and the comparative inferiority of our product, stimulated us to further efforts in the direction of improving the quality of our salt.

Our first attempts to manufacture a neutral high quality salt, which started in January 1918, were unsuccessful owing to the proposed processes being too complicated for economic large scale production. One process of this order produced from ordinary gas works sulphate a particularly pure material possessing all the required physical properties but the installation and working costs were too high to allow us to proceed with manufacture. You will observe from the sample manufactured by the application of this process in a small unit that the material appears to be very similar to the German synthetic product, and I must say that we have never been able to manufacture by subsequent processes a material with such an excellent appearance. We also tried processes, which, up to 1919, had been patented, but for one reason or another turned them down, the main reason being that the appearance of the final product compared unfavourably with the ideal we had been forced to set oursleves.

The Company's Process

The process now adopted by our Company for the manufacture of neutral sulphate of ammonia provides for neutralising the sulphate by means of condensing the vapours from the fixed ammonia still, diluting the solution of ammonia thus obtained until its strength is such that it loses practically no ammonia at the temperature at which it is used, and then washing the crystals of sulphate of ammonia in the centrifugal machine at 75°C.

The sulphate plant operated by us is provided with separate stills for dealing with the free and fixed ammonia of ammoniacal liquor. A 2-in. pipe is taken from the gas pipe connecting the two stills, which in turn is taken to the serpentine condenser placed directly above the centrifugal machine. In the case of installations operated with a single column still, the ammonia condensate is obtained from a pipe connected above the liming chamber of the still or from the top tray of the fixed still in those plants where such is furnished. The serpentine cooler described allows of an appreciable accumulation of wash liquor. Indeed, it is only necessary to shut off the ammonia pipe for 60 seconds to transfer to the blow pot sufficient liquor to neutralise one ton of salt per hour. It is found that the condensate from the fixed still consists essentially of ammonium hydrate of fairly pure character. The purity of the condensate, that is, its freedom from sulphides, carbonates or cyanogen compounds, is a function of the temperature to which the ammoniacal liquor is preheated, the efficiency of the free still and the time contact and effectiveness of the liming arrangements.

We find that 8 gallons of condensed ammonia solution containing 0·5 per cent. NH_3 suffice to neutralise one centrifugal charge, viz., 6 cwt. of acid salt containing 0·4 per cent. H_2SO_4. Calculation shows that the ammonia actually used is only about 40 per cent. of that theoretically required to neutralise the sulphuric acid held by the salt. This is due to the fact that in the centrifugal basket displacement or washing as well as neutralisation proceed simultaneously. During this neutralisation small quantities of ammonia do escape, but the evolution of pyridine by the decomposition of pyridine sulphate and its replacement by ammonia is the chief source of objection. It has thus been found advisable to install a suitable draughting device over the centrifugal machine.

The procedure of neutralising the salt in the basket of the centrifugal machine is as follows: The salt is directly discharged from the saturator into the centrifugal machine and is there whizzed for a period of two minutes at full speed for the purpose of allowing the major portion of the acid mother liquor to be removed. At this stage the speed of the machine is reduced to such a velocity that the basket is just revolving and the ammonia solution is sprayed on to the bed of the salt until the predetermined quantity, namely 8 gallons, has been applied. Drying is then completed at the maximum speed and the salt discharged.

After neutralisation, the salt which contains from 1 to 1·5 per cent. moisture, is discharged from the centrifugal machine and conveyed to a drying tower. This next procedure is considered by us to be an essential feature of the process. Investigation has shown that the hygroscopicity of the acid sulphate

is due to the free acid present; further that if a completely neutral sulphate of ammonia be dried it will continue to retain its physical condition and the crystals do not subsequently cement together. Such a material when in contact with moist air certainly hardens on the surface. Indeed, any salt will do this, but hardening takes place at the surface only, and does not penetrate into the mass. Thus the slightly bound crystals can be easily separated by crumbling between the fingers. You will observe that the salt here exhibited, which has been taken from our ordinary store heap, will fall through the fingers like grass seed. It is essentially this physical nature that the farmer requires, so that the salt may be either strewn upon or drilled into the ground without presenting those objections that the acid containing material must have done. It is perfectly certain to us that although it is a distinct advantage to produce material which will not effect any rotting of the bags, yet that in itself is not enough; the physical nature of the product is also a factor of very considerable importance.

Drying is effected by means of heated air, the salt gravitating against the upward current of air. In this drying tower a series of baffling arrangements have been devised to aid the distribution of the salt and the elimination of water. The baffling effect is carried out by means of hollow perforated pyramids which act as a distributing umbrella together with staggered triangular bars and flaps and this arrangement has been arrived at as the result of experience. The necessity for completely separating the salt at the first stage of the drying process is essential as there is a tendency in the presence of so much liberated water vapour for the material to clog together.

The salt is fed into the tower, kept in rapid motion and obviously well distributed, and eventually collects at the base from which it is discharged on to a travelling conveyor leading to the boot of the elevator which in turn feeds the salt again to the tower. In this way a circuit is established, and the salt is maintained in circuit until the requisite degree of dryness is obtained. As before stated, the salt leaving the centrifugal machine contains 1 to 1·5 per cent. of water, and the final salt is dried to a standard of 0·04 per cent. Approximately 80 per cent. of the water is removed in the first cycle. Several additional cycles are necessary to obtain the degree of dryness required. The whole operation occupies from 10 to 15 minutes depending on the moisture content of the original sulphate, the size of the crystals and the temperature of the heated air.

It is our practice to effect the removal of moisture by means of air raised to a temperature of 150°C., and for the purpose of heating this air a furnace is constructed outside the sulphate building. After the salt is dried in this apparatus, it is transferred to store by the conveyor, which may, at will, be directed to this purpose.

An important question, however, in considering the practicability of processes for the manufacture of neutral sulphate relates to the quantity of mother liquor produced in the process. The experience gained during the two years in which this process has been operated leads us to believe that no trouble need be anticipated from surplus mother liquor, provided the strength of sulphuric acid supplied to the sulphate of ammonia plant does not fall below 70 to 72 per cent. H_2SO_4.

There are a number of small details in the working of this process, such as the production of a colourless salt, of well-defined crystals, &c., which could be elaborated upon, but this would result inf lengthy paper and such matter would appear to relate generally to the manufacture of sulphate of ammonia rather than particularly to the manufacture of a neutral salt.

Finally, it is essential that the buildings in which the neutral and dry sulphate of ammonia is stored in bulk should be reasonably well ventilated, and that the drainage should be adequate and efficient.

It is interesting to remark for the purpose of demonstrating the advantages of a neutral dry salt to the user that the charging hoppers from which we fill our bags of sulphate gave us trouble when the first batch of neutral dry sulphate was loaded. The simple wooden slides which were formerly quite capable of shutting off the supply of salt entirely failed to hold this new material, which ran through the sides of the slide almost like water, and necessitated the provision of a tightly fitting slide.

The cost of operating the neutralising process is 4d. per ton, whilst the drying process costs 11d. per ton of sulphate made.

In conclusion, will you allow me to state that, although we are in every way satisfied with the process I have described to you, I do not come to recommend for your adoption any one particular process.

A paper was afterwards read by Mr. A. G. Cheal (Crowborough) on "Some Experiences with the Direct Recovery of Sulphate of Ammonia." This, with the discussion, is held over until next week.

The Institute of Physics

(From a Correspondent)

THIS Institute has now been incorporated and has begun to carry out its work. The object of the Institute is, on the one hand, to secure the recognition of the professional status of the physicist, and, on the other hand, to co-ordinate the work of all the societies interested in physical science or its applications. This co-ordination has already been secured by the participation of five of these societies, namely: the Physical Society of London, the Optical Society, the Faraday Society, the Royal Microscopical Society, and the Röntgen Society. The Institute thus promises to become a powerful unit in connection with any wider scheme of federation of scientific societies.

The first list of members includes the names of over 200 Fellows. Sir J. J. Thomson, O.M., the retiring President of the Royal Society, has accepted the invitation of the Board to become the first and, at present, the only Honorary Fellow. It is a tribute to the status already acquired by the newly formed Institute that its diploma is now being required from applicants for Government and other important positions requiring a knowledge of physics, and, thanks in great part to the Institute, the physicist is now becoming recognised as a member of a specific profession.

The first President of the Institute is Sir Richard Glazebrook, K.C.B., F.R.S., who will preside at the first statutory meeting of the Institute, which will be held early in the new year. Particulars with regard to the qualifications required for the different grades of membership can be obtained on application to the Secretary, 10, Essex Street, London, W.C.2. Fellows elected before May 1, 1921, will have the privilege of being styled Founder Fellows."

Valves

Thermostatic valves, to be of efficient use, must have, of necessity, a large travel at the valve for a reasonable drop or rise in temperature, and unless they have this travel, the full duty cannot be obtained from the calorifier. The use of metals as the expanding medium has been proved to give insufficient travel, and in this point lies their inefficiency. Hot water for domestic use or heating purposes derived from a calorifier or heating tank, should have the steam supply so controlled that when no water is being used and the tank is hot no steam should be passing into the tubes or coil; and as soon as any water is drawn off, the steam should be admitted to heat the cold water which has taken the place of the hot water used. An automatic control valve, to fill the above conditions, should be of such construction that the steam is not cut off until the tank is hot to the bottom, thereby allowing a full storage of hot water; and the valve should open and pass steam as soon as cold water is admitted, through the hot being drawn off.

The Home Engineering Co., St. Peters Lane, Glasgow, are the makers of the "Home" thermostatic valve.

Tablets and Ointment

ROTARY Tablet Machines in two sizes, 12 punch and 20 punch, also single punch machines in various sizes and for various shapes are made by S. W. Wilkinson & Co., Western Road, Leicester. The same firm are the makers of the "Speedy" Ointment Mill, which combines mixing and grinding for all ointments, pastes and paints. The mill is claimed to be an improvement on the Edge-Runner and Roller Mills, and can be fitted with an electric motor. It will make all kinds of ointments and is used by some of the largest manufacturers.

Society of Chemical Industry
Newcastle Sectio n

DR. J. H. PATERSON presided over a well-attended meeting of the above section on Wednesday, November 17, when Mr. F. H. Jennison read a paper on the "Use of Tannic, Arsenious and Phosphoric Acids in the production of lake pigments from basic dyestuffs."

The Chairman, in announcing the next meeting for December 15th, said that short papers would be read by Mr. S. H. Collins and Dr. A. A. Hall. Several members had promised to bring along interesting exhibits, and he asked all members to do their share towards that interesting part of the Society's meetings.

Mr. Jennison conducted numerous experiments, and the extremely long paper was largely dependent on the experimental work. The object of the paper was to show how it was that the most effective precipitating agents for basic colours, *i.e.*, tartar emetic and tannic acid, were not available in all cases for the production of lakes of the colouring matters, and, as the use of arsenious and phosphoric acids involved the preparation of substances similar to those that were formed for the production of alizarine lakes, the description of those substances with the physical properties required for their successful application to various purposes would give some idea of the nature of the problems involved in the production of lakes from mordant dyestuffs. He used the term lake colour to distinguish pigments made from dyestuffs and colouring matters by precipitating the colouring matter in such a form that it could be used for pigmental purposes. The conversion of a dyestuff into an insoluble pigment, said Mr. Jennison, was not feasible in many cases, for its properties were such that it was of no use as a pigment. There were also the pure tannic acid lake of magenta and the pure barium lake or brilliant carmine, both of which, from their hard and horny nature, were of no use as pigments. After referring to the results of eighteen separate experiments, Mr. Jennison concluded by saying that it would be readily grasped that to prepare the compounds for the preparation of alizarine lakes where precipitated, the phosphoric acid combinations of aluminium together with the introduction of calcium salts and in some cases the traces of other metallic oxides, was a problem which needed very careful attention.

Edinburgh and East of Scotland Section

AT a meeting of the Edinburgh and East of Scotland Section on Tuesday, November 16, Dr. D. S. Jordan, who presided, announced the presence of Mr. Fawsitt, Professor of Chemistry in the University of Sydney, Australia, and welcomed him among them.

Possible Chemical Inventions

Dr. A. C. Cumming in a Paper on "Possible Chemical Inventions" said that everything was possible to faith admixed with just the right amount of knowledge. Too much knowledge was just as fatal as too little, and the only adequate epitaph for one of the most learned chemists of his day was that he knew so much that he never did anything. Sir William Ramsay was a great example of the type who did not realise what was impossible or at least what other people regarded as impossible, and consequently made some of the greatest discoveries of his time. From a review of modern chemical industries it was evident that we were now dependant for common commodities on chemical processes which thirty or forty years ago would have been regarded as quite impossible. Changes in modern chemical industries were likely to come in general through conscientious and painstaking examination of all details of the existing process; startling advances were only possible by the discovery of completely new chemical processes. It was not likely that there were many entirely new reactions to be discovered, but there was always a possibility of speeding up a slow reaction, and there was always a possibility of finding conditions whereby a very small yield might be greatly increased. As examples where possibilities of this sort existed, various methods for the fixation of atmospheric nitrogen were discussed, and also some other processes. Dr. Cumming was of opinion that sudden improvements were only possible in cases where a new catalyst could be discovered, or in some cases by the scientific application of colloidal chemistry.

Some Reminiscences

Professor Fawsitt on being invited to take part in the discussion said he was for many years secretary of the Scottish Section of their Society, and in these old days they had one of the meetings in each Session in Edinburgh, and the others in Glasgow. He did not think the Edinburgh meetings were against success then, and it was pleasant to see that others had made such a success of the Association. One of the matters Dr. Cumming had raised was whether research in applied chemistry was of equal or of greater importance than research in pure chemistry, and he pointed out that if there was far more research made in regard to applied chemistry it would be considered equal in value to research in pure chemistry. The success of the British nation in particular was very largely bound up with its progress in applied chemistry. Whatever progress might be made he felt certain that it would be the common property of the nations. It would be very difficult for America or Britain to keep to itself any secret processes for any length of time. The only way in which the British nation could keep its predominance in the industrial world was by having at the head of affairs the most efficient brains that they could procure. He regretted very much to see that even yet in this country people were selected for conducting chemical processes among others who were not the men who could most efficiently do the job, and that owing to influence and other causes brains did not always receive their own reward.

The discussion was contributed to by Messrs. D. B. Dott, Williams, Luff, Brown, Sim and Cameron.

Fatal Explosion: Damages Awarded

BEFORE Mr. Justice Greer, in the Civil Court at the Manchester Assizes, Mrs. Margaret Shields, of Ardwick, was the plaintiff in an action brought against H. N. Morris & Co., Ltd., Alpha Analine Dyeworks, Denton, to recover compensation, under the Fatal Accidents Act, for the loss of her son, John Shields, age 21, who was killed by an explosion in the works.

Shields was a fitter employed by the defendant company. The plaintiff was entirely dependent upon him. On March 16 last Shields and a man named Longden were engaged in the alteration of certain pipes in a part of the works which had been closed since July 10, 1919. The pipes were used in connection with the manufacture of di-nitro-phenol, which was employed in the preparation of sulphur block. While the men were so employed an explosion took place. Both were killed, and damage was done to the building. A third man who was outside, and was struck by some flying fragments, was also killed. The suggestion was that while the department had been closed some of the acid had dried in the pipes, and the explosion was caused by the concussion of hammers which the deceased men might have used.

Scientific evidence was called, and on the part of the plaintiff it was urged that it was not a proper thing to handle plant in which there might be some of the acid in a dry state. On the other hand, an expert chemist expressed the view that the explosion was not caused by this particular acid, which was not present in sufficient quantity.

The Judge said he should hold that the exposion was due to the presence of di-nitro-phenol. The deceased man was employed to assist in certain engineering work connected with the reorganisation of the premises, and was in the position of a temporary plumber repairing pipes. Such a person did not undertake the risk of there being di-nitro-phenol on the premises. It had been established to his satisfaction that there was nothing else which could have caused the explosion. He found for the plaintiff, to whom he awarded £500 damages.

Charles Massey & Sons have transferred the commercial side of their Waterloo Works, Newcastle, to their Head Office in London. Communications should now be addressed to Charles Massey & Son, Ltd., Branch of British Glues & Chemicals, Ltd., Imperial House, Kingsway, W.C.2. Statements of accounts owing by Chas. Massey & Son, Ltd., should be made up to and including November 27, and sent to the Head Office. Remittances should be made payable to British Glues & Chemicals, Ltd.

The Handling of Liquids in Chemical Works

By J. H. West, A.C.G.I., A.M.Inst.C.E.

A LECTURE upon this subject was delivered at the Manchester College of Technology by Mr. J. H. West, on Thursday, November 18.

Mr. West said that it would be profitable to devote a little time to the consideration of the hydraulics of the flow of liquids through pipes, because, in designing the pipes in a chemical works, to get the sizes correctly was of great importance. In very many chemical works there was an immense loss of time, and of output, through too small pipes being used and too long a time being taken to empty vessels.

There were distinct problems in the flow of water through pipes. First of all, there was the actual flow under gravity. If a certain pipe was arranged with a certain length, and with a set of given conditions, water would only flow through that pipe provided it was kept full at a certain rate. It was chiefly the velocity which required to be determined. That velocity depended upon two factors: (1) the hydraulic slope, or hydraulic gradient, and (2) the factor of friction of the liquid against the walls of the pipe and friction between the concentric layers of the liquid; because owing to the friction on the sides the velocity against the walls of the pipe was slower than the velocity of the centre, and there were concentric portions of the water slipping past each other and causing a certain amount of friction.

Numerous formulæ had been evolved for the purpose of ascertaining the velocity of flow through pipes under gravity, and the lecturer introduced those which had been worked out by Mr. A. A. Barnes, who was formerly, he believed, the chief engineer of the Manchester Corporation Waterworks. Mr. Barnes's formulæ, which were based entirely upon experimental results, could be adapted to any given conditions of velocity of flow, and applied to various kinds of pipes, such as uncoated cast-iron, asphalted cast-iron, uncoated lap-welded steel, lead and glass, in relation to the velocity of the flow of cold water.

Having arrived at the velocity the next step was usually to convert it into gallons per hour. The method of calculation was then explained.

The velocity having been fixed it was necessary to know how much friction would be developed in order to determine the necessary pumping pressure and power required. Mr. Barnes had worked out a formula by means of which all these data could be obtained. When a pipe was designed to carry 5,000 gallons of water per hour an additional percentage was allowed for corrosion of 7 or 10 per cent., so that it would still be within the reasonable limits of friction.

Pumps

The subject of pumps was dealt with at some length. Valves were really the biggest source of trouble in a pump, especially in a chemical works, but his (Mr. West's) experience was that at least 80 per cent. of the trouble from valves, apart from corrosion, was due to not putting strainers on the suction pipes of the pumps. If an efficient strainer was fitted to a suction pipe all sorts of extraordinary things in the vicinity of a chemical works would be kept out of the pump; such as bits of string, sacking or wood. The great thing about a strainer was to have its area very large, wire being a good material with which to construct it. Its area of "draw" should be at least 20 times the cross-section of the pump.

Many of the pumps dealt with by Mr. West were, he said, quite suitable for pumping strictly neutral chemical liquors, and they could be obtained as quite standard articles, with certain modifications, for dealing with chemical works and chemical liquors. The Ferraris, and Kestner patent acid pumps were also explained.

Pumps for dealing with thick liquids, such as tar, were next dealt with. The lecturer pointed out a type of valve which was not positively active but was raised simply through the pressure of the liquid. With a thick liquid like molasses, or tar, such valves were not suitable as they stuck up and did not go back on to their seats. The form of construction of impeller blades for centrifugal pumps was explained. The "Douglas" pumps, used for sulphuric acid, hot tar, oils, greases, &c., was then described in detail.

Manchester Firm and Sodium Contract

ON Wednesday in a King's Bench Divisional Court, Justices Rowlatt and McCardie had before them an appeal by the defendants, Lockspier & Co., of Manchester, against a judgment of Judge Jackson of the City of London Court, in favour of Geo. Wm. Hartley Florey, a chemical merchant, in an action he brought against the Manchester firm, claiming damages for breach of contract relating to the sale by the defendants to plaintiffs, of a quantity of sodium sulphate.

Mr. Woodgate, for the appellants, said in the City of London Court the judge held at the close of the plaintiffs' case that there was no case for the defendants to recover. The question for their lordships was whether there was a case to recover by the defendants. Defendants in Manchester offered plaintiff 6 tons of sodium sulphate at £42. 10s. a ton, "subject to goods being unsold and to safe arrival next week." Plaintiff accepted the offer, but as the goods were not delivered he wrote to the defendants, and they replied that he could do as he pleased, that the goods had not arrived, the reason being that their suppliers had failed to deliver. Counsel submitted that the contract contained a representation that the seller had got the goods and that threw the onus on the defendants, to prove that they had not arrived and the reason why.

Mr. Mockett, for defendants, submitted that on the true construction of the contract his clients were protected by the exception "subject to safe arrival." His clients had a contract, but they were disappointed by their suppliers.

The Court held that the non-suit by the City of London Court Judge was wrong, and that under these circumstances, there must be a new trial. Defendant was entitled to an opportunity to get out in detail the facts he relied upon and then there would be a decision on those facts. A new trial was ordered accordingly.

An Agreed Dyes Scheme

A JOINT meeting of the Lancashire members and the Commercial Committee of the House of Commons, arranged by Mr. Waddington, M.P., was held at the House of Commons on Wednesday. Sir Thomas Robinson, M.P., presided.

Mr. Vernon Clay, chairman of the Colour Users' Association, attended, and explained in some detail the methods proposed to be adopted of prohibition and licensing. He and his Association had come to the conclusion that prohibition and licensing, while by no means ideal, were the only practical means of building up a successful dye industry in this country.

Mr. Clay reported that there was every probability that the dye-makers and dye-users and the allied chemical trades would come to an agreement. If so, they would submit their scheme to the President of the Board of Trade as an agreed scheme, and they wanted the support of members of Parliament, if necessary, to influence the Government to bring in a separate Bill for the dye industry at once.

Explosive Trades, Limited

EXPLOSIVES Trades, Ltd., have changed their name to Nobel Industries, Ltd. Many branches of this firm are now employed in a number of industries entirely unconnected with the explosives trades. About 60 per cent. of the company's capital is, in fact, employed in non-explosive products and, therefore, the name Explosive Trades, Ltd., was inadequate and partially misleading. The name of Nobel is widely known and the firm's output of explosives is still enormous.

Restrictions on Benzine

AT an inquest on Monday on a woman who was killed through her clothing catching fire it was suggested by the Coroner that more stringent rules should be introduced with regard to the sale of benzine. Death occurred by accident. It appeared that the woman was using benzine for cleaning purposes, and in lighting a fire the vapour, it was suggested, became ignited and back fired" to the bottle, which exploded and set the woman's clothes on fire. An L.C.C. inspector told the Coroner that there were no restrictions on the sale of benzine, anyone might buy up to 24 bottles, each containing a pint, without a license.

Industrial Uses of Scientific Instruments

Recording and Measuring Appliances for Controlling Works Processes

The present issue of THE CHEMICAL AGE *deals specially with the uses of recording and measuring instruments for controlling processes in works. The introduction of scientific instruments for these and other purposes is found to result in much more accurate control and is bound to grow as the advantages become better understood and appreciated. We give below notices of a number of such appliances, not as being an exhaustive treatment of the subject, but as illustrative of the general advantages of scientific, as distinct from "rule of thumb," control*

Fuel Saving by Furnace Efficiency

By Sydney N. Duguid, B.Sc.

IT will generally be conceded that the efficient maintenance and economical operation of a modern steam-generating plant necessitate a high degree of skill and foresight, and that the present cost of all fuels renders the production of the greatest amount of steam with the least expenditure of fuel of paramount importance.

Hence the desirability of equipping the boiler plant

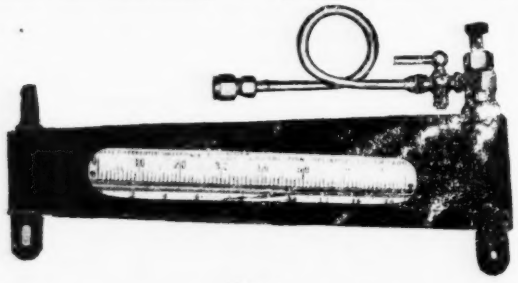


FIG. 1.

with appliances which will indicate not only exactly what it is doing, but also what it is capable of doing, under suitable conditions of fuel supply, stoking, draught, feed water supply and other factors, which go to make up efficiency.

Such appliances should be reasonable in price, of guaranteed accuracy, easily worked and easily compre-

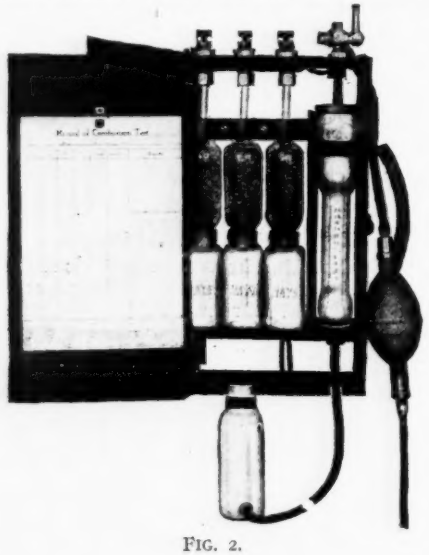


FIG. 2.

hended, and thus bring to the working engineer the means whereby he need no longer, to a large extent, be in the dark as to the why and wherefore of what is going on in the plant under his control. It is claimed that the four instruments supplied by the Duguid Instrument Supply Co. fulfil these requirements.

These are the Hays draught gauges, gas analysers, CO_2 and draught recorders and automatic gas collectors.

Draught regulation is one of the most important factors in obtaining and maintaining combustion efficiency. There is a certain draught that will carry the load most satisfactorily and burn the fuel with the greatest economy. This draught may be determined by putting a draught gauge on each boiler and carrying out a series of tests, using the gas analyser for determining the CO_2 in the flue gases. By varying the draught, and thickness of the fuel bed, the relation between draught, fuel thickness and CO_2 can be determined for each boiler, and thus the most economical draught to use in each case can be found. Speaking generally, the correct draught to use is the one that will carry the load and produce the maximum percentage of CO_2 without CO or O_2. The Hays draught gauge is specially suitable for such tests as it is extremely sensitive, readings of one-hundredth of an inch being easily taken from it. It is also provided with a zero-setting device, and also provision is made for checking the zero without disconnecting the gauge in any way. Movable pointers

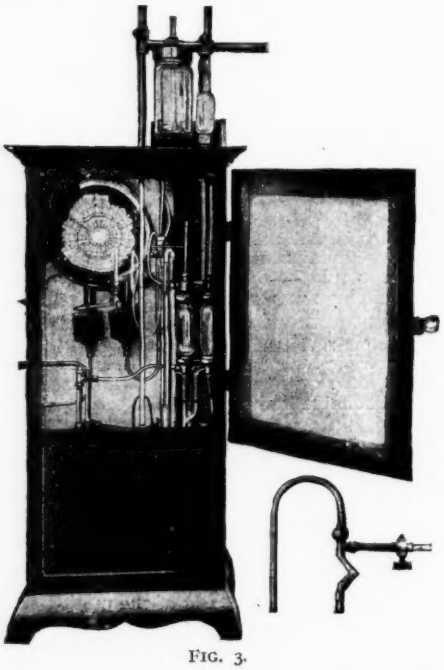


FIG. 3.

are also provided for indicating to the stoker the draught to use. Cracks or holes in the fuel bed are detected at once by the movement in the gauge, and if the fuel bed is attended to right away, the steam pressure can be maintained. Thus the draught gauges will warn a fireman that his fires need attention several minutes before the fall indicated by the pressure gauge intimates the same fact. By means of a few simple fittings the same gauge can be arranged to show loss in draught between the furnace and the last pass or damper, and this will give a check on the development of air leaks in the settings.

The Hays gas analyser is operated in a somewhat similar manner to an Orsat apparatus, but is so different in design that tests can be made at the rate of one per minute by an intelligent boy. Glass cocks and pinch clamps have been replaced by needle valves. The type illustrated will deal

with three gases, say, carbon dioxide, oxygen and carbon monoxide. The CO_2 pipette can alternatively be used for the determining of the percentage of practically any acid gas, SO_2, NO_2, &c. The instrument weighs only $7\frac{1}{2}$ lbs., is provided with a handle for carrying about, and when in use hangs on a nail in the wall.

The common method of checking the percentage of CO_2 produced, and thus seeing whether a high furnace efficiency is being maintained, is to install a CO_2 recorder. Fig. 3 shows the Hays type of recorder which, besides recording the CO_2, also records the draught on the same chart, the readings being entirely visible at a glance. This instrument is of the absorption type, caustic potash being used. The caustic jar holds about 1 gallon, so that it does not require renewing for a long period. With the object of eliminating wear and tear, and preventing stoppages rather common in instruments of this kind, the Hays type has been designed so that there are no moving parts at all except the pen mechanism. The pens are actuated by metallic bellows, somewhat similar to those in an aneroid barometer, the CO_2 bellows being extended by the pressure put upon them, due to the volume of the gas sample after the CO_2 has been absorbed, and the draught bellows being sensitive to suction. There are no adjustments whatsoever to be made, as the instrument automatically resets the zero level after each analysis. During measurement and absorption the gas sample is protected against changes in volume due to variation in temperature, this being accomplished by having the measuring burette and absorption bulb immersed in a water bath. A low-efficiency alarm is provided which will ring a bell or light a lamp when the percentage of CO_2 falls below that for which it is set.

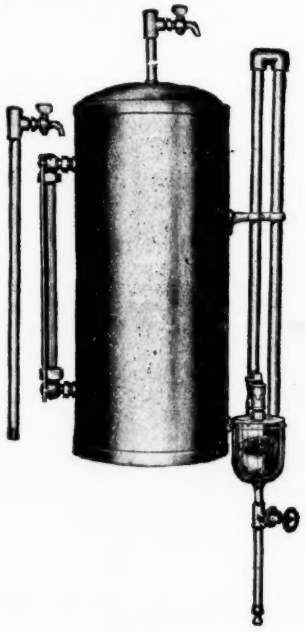


FIG. 4.

The Hays automatic gas collectors collect an "average" sample of the flue gases (or any other gases) over any period desired up to 36 hours. It is not an easy matter to collect an "average" sample. To fill a bottle with water and allow gas to be drawn into the bottle as the water trickles through a cock at the bottom of the bottle will not give an average sample, as the head on the outlet is constantly diminishing, and thus the level of the water will not fall at a constant rate. To get over this difficulty the outlet from the Hays collector is provided with a copper float like a diving-bell, the top of which presses against the spindle of a small valve. It is very similar to a carburettor. In this way the head on the outlet remains constant whatever the level of water in the collector may be, and the sample obtained is an absolutely average one. The connection to the flue (or gas container) is made at the top of the collector and another connection at the bottom to the water main. When the gas sample has been collected the gas supply is shut off and the water turned on. The water rises in the collector and displaces the gas sample through the cock provided, and to which the gas analyser, previously described, has been connected by means of a rubber tube. By putting one of these collectors on each boiler it is possible to check shift against shift, and also firemen against firemen.

The largest single loss that may occur in any boiler plant is due to the fuel being burnt inefficiently, and consequently it is in the furnace where the largest saving can generally be effected.

Measuring Instruments

Electric CO_2 Apparatus

AN entirely new instrument is the electrical CO_2 Indicator, which enables the percentage of CO_2 in flue gases to be determined by an electrical method, without use of any chemical absorbent.

The method employed is one devised by Dr. G. A. Shakespear, of the University of Birmingham, for testing the purity of gases. The composition of the flue gas is compared with that of air by means of an instrument known as a katharometer, which consists of two identical spirals of platinum wire contained in two cells drilled in a copper block, each of the spirals being connected to form one arm of a Wheatstone Bridge circuit. If a fairly large current is allowed to flow in this circuit the two spirals will become heated and will lose heat to the walls of the cells. The rate of cooling will depend on the thermal conductivities of the gases in the cells, so that if the two cells contain gases of different conductivities the two spirals will cool at different rates, and one will therefore be maintained at a lower temperature than the other. The difference in temperature of the two wires will cause a deflection of the galvanometer, the extent of the deflection depending on the difference in conductivity of the two gases. If, therefore, one cell of the katharometer contains a pure gas and the other the same gas mixed with some other constituent, the extent of the deflection will be an indication of the amount of the second gas present, and the galvanometer can be calibrated to show directly the percentage composition of the mixture. The difference in conductivity between air and carbon-dioxide enables the method to be employed to determine the percentage of CO_2 in flue gases.

A single point indicating outfit is shown in Fig. 1. This

FIG. 1.

consists of a CO_2 meter, which is fixed into a pipe communicating with the flue, and an indicator to which it is connected by means of 4-way leads. Current is supplied from a 2-volt accumulator. A soot filter is inserted between the meter and the flue, and an aspirator may be supplied to draw the gases past the meter.

The indicator is a double pivoted pointer galvanometer enclosed in a dust proof case, and mounted on a wall bracket. It has a scale reading from 0 to 25 per cent. to CO_2.

Any desired number of points may be connected to one indicator, and the accuracy of the reading will not be affected by their distance from it. This will be found a great advantage since it enables the indicator to be placed in any convenient position.

Pressure and Thread Recorders

Permanent records are obtained by use of a Thread Recorder, which is a suspended coil galvanometer, the pointer of which is depressed at regular intervals on to a thread impregnated with ink. The thread is pressed by the pointer on to a chart covering a clock-rotated drum and the succession of dots given forms a continuous and reliable record of the percentage of CO_2 present. The Thread Recorder is illustrated in Fig. 2.

Another instrument of very recent design is the Cambridge Pressure Recorder (*see* Fig. 3), which is suitable for steam liquid or gas pressure up to 500lbs. per sq. in., and can also be supplied with a considerable vacuum range. In this a Bourdon spiral is connected to a union by means of which it can be

attached to a copper tube taken from the position at which the pressure is to be measured. The movements of the spiral are communicated to a pen arm which moves over a clock-rotated chart graduated in pressure and covering a period of 24 hours or 7 days. The large diameter of the chart allows very small changes in pressure to be recorded clearly and accurately.

Distance Thermometers

By the use of Electrical Distance Thermometers temperatures of any number of scattered points may be read from an indicator or recorded upon a chart situated in a central position. The principle utilised is that of the varying resistance of platinum wire to electric current in accordance with its temperature, and the bulb consists of a platinum coil which is made to form one arm of a Wheatstone Bridge. The variations in resistance of this arm brought about by changes in the temperature of the soil, are indicated by a galvanometer calibrated to read directly in degrees Fahrenheit or Centigrade. The diagram shown in Fig. 4 illustrates the connections between thermometers and indicator. Fig. 5 is an indicator of the kind usually employed mounted on a slate switchboard. With the distance thermometers a Thread Recorder may be employed, and with the aid of a 2-colour thread mechanism permanent records can be obtained simultaneously of the temperatures at four different points. The range of temperatures on which these Distance Thermometers can be used is −330°F. to +1,000°F.

These instruments are made by the Cambridge and Paul Instrument Co., Ltd., 45, Grosvenor Place, S.W. 1.

FIG. 2.

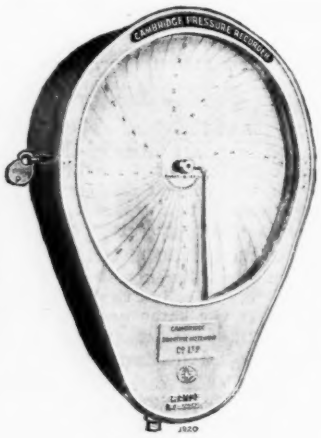


FIG. 3.

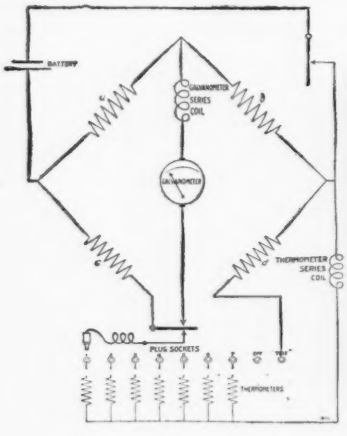


FIG. 4.

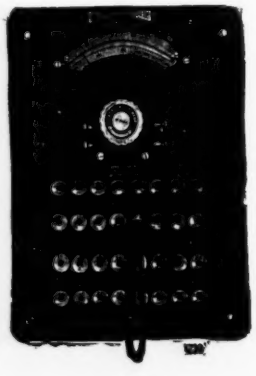


FIG. 5.

Optical Pyrometer

THE use of pyrometers has now become a commonplace in the modern up-to-date works, the instruments used being for the most part of the electrical type. While many admirable instruments constructed on this principle have been introduced into works practice, in the opinion of many users there still exists a need for a simpler type of pyrometer, which should not require frequent renewals or the constant supervision of an expert electrician. It is claimed that this need has been met by the "Wedge" Pyrometer, an optical pyrometer constructed on a simple principle, and according to the manufacturers, very easy to operate accurately.

The instrument consists essentially of a brass tube furnished with a small telescope, so arranged that the objective of the telescope focusses the image of the heated body on the movable prism placed inside the tube. The eye-piece of the telescope then reveals the image on the prism to the observer. At one side of the tube is a milled head actuating a rack and pinion which moves the prism through the field of vision. The prism is made of specially prepared dark glass, so arranged that it cuts off the light emitted by a heated body at various temperatures. For example, in looking at a heated bar of iron at a temperature of, say, 1,000°C., on turning the screw the thicker part of the prism comes gradually into the field of vision, and the bar appears gradually a darker and darker colour, until at a given point the colour entirely disappears, this point giving the actual temperature. On looking at the scale at the side of the instrument, the pointer will be seen at 1,000°C.

Naturally a certain amount of practice is necessary to decide the exact moment when the light disappears, the amount necessary depending on the eyesight of the observer, but a few days' use enables anyone of ordinary eyesight to become an expert. The distance from the object will not affect the readings. The size of the instrument is such that it will go into an overcoat pocket quite easily, and there are no accessories required, except that where very accurate readings are required, the use of a stand is recommended.

The manufacturers of the "Wedge" Optical Pyrometer are the Optical Pyrometer Syndicate, Audrey House, Ely Place, E.C.1.

The Nutting Colorimeter

Purposes of the Instrument

THE main purpose for which the Nutting colorimeter has been designed is the analysis and specification of colours, for instance, those of papers, powders, liquids, textiles, fabrics, colour screens, or light sources. It is also an instrument for photometry (including spectrophotometry), visual sensibility determinations, hue sensibility determinations, and purity sensibility determinations. With this instrument it is possible to measure and record numerically a colour so that at any future time, and with a different instrument of the same kind if desired, it can be accurately reproduced from the record.

Accurate determinations of colour blindness and lesser abnormalities of colour sensibility come within its scope. There are clearly a great number of other uses of great value in the arts and industries. For instance, the colours of natural objects (plumage of birds, flowers, &c.) can be specified, the fading or darkening with time of coloured objects or pigments measured, the accuracy of colour reproductions checked, colour matching carried out by correspondence, trials of colour harmony schemes effected, and so forth.

Fundamental Principles

It is well known that any colour may be analysed and specified in either of two different ways: (1) in terms of three primary components, red, green and blue (trichromatic analysis); or (2) in terms of wave-length of dominant hue or its complementary and the percentage of white (monochromatic analysis).

Of the three elements of colour, hue, tone and luminosity, hue and tone are determined with a colorimeter, luminosity

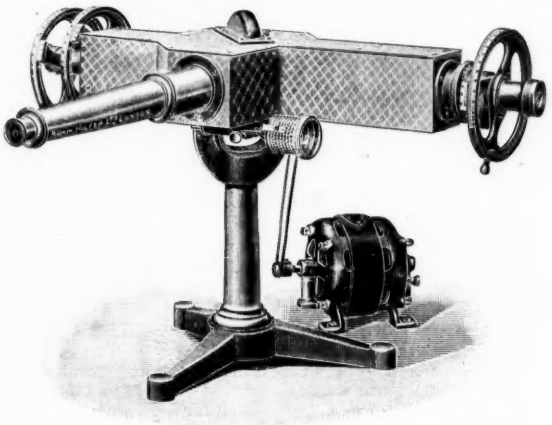
with a photometer or photometric part of the colorimeter. In the present form of colorimeter the photometer is an integral part of the apparatus.

Colours to be analysed consist of light either emitted from some source, transmitted through some selective screen, or reflected from some mat or semi-mat surface. Any one of these colours to be analysed may be either spectral or purple, according to whether or not its dominant hue lies in the visible spectrum. Any analysing colorimeter should then be applicable to emitted, transmitted or reflected light of either spectral or purple dominant hue.

The advantage of monochromatic analysis lies in the elimination of the arbitrary reference standards (red, green and blue), readings being given in wave-length and per cent. white. Both methods give readings varying somewhat with the observer, involving in some cases correction to the absolute colour scale based on the average properties of a number of normal eyes.

The Nutting colorimeter utilises the method of monochromatic analysis.

Colour measurement with this instrument is effected by mixing pure white light with light of a pure spectral hue. The hue and the proportion of white are varied until the mixture matches the colour to be analysed. Finally the wave-length of the dominant hue and the percentage of white admixed are determined and these two qualities (*hue* and *purity*) recorded as specifying the colour determined. This procedure suffices for analysing all colours, except the purples. For these, light of a pure hue is mixed with light of the



NUTTING CALORIMETER

unknown colour in such a proportion that the mixture is pure white, and the specification of the colour follows in an analogous manner.

The Instrument

The Nutting colorimeter is essentially a spectroscope with two additional arms, one to admit standard white light, the other the light to be analysed. The instrument as made by us has been modified considerably from Dr. Nutting's original model, the latest form (which has been approved by Dr. Nutting) embodying many points which his experience has shown to be desirable. A sketch plan of its latest form is shown in the illustration.

There is a special collimator to admit light to be spread into a spectrum. The dispersing prism is of the constant deviation type, thus permitting the fixed arm type of spectroscope to be used. The prism is rotated by a fine screw motion actuated by the drum on which the wave-length of the line under observation is read off direct in wave-lengths.

The intensity of the spectrum is variable at will by adjustment of a bi-lateral slit or by the rotation of one of a pair of polarising prisms. In this way a great range of intensity can be obtained in the spectral beam. In making measurements the rotation of the polarising prism should be adopted, the relative brightness being determined in the usual way.

The spectral light can be mixed with the white light in any desired proportion, and the latter can also be altered in intensity by means of polarising prisms. Thus the hue, proportion of white and intensity of the light to be analysed can be exactly matched.

Means are provided to measure the hue, proportion, white, and intensity; and there is scarcely any conceivable work in connection with colour, colour vision, or spectrophotometry with which the instrument is not suited to deal.

Full particulars can be obtained from the makers, Adam Hilger, Ltd., 75A, Camden Road, London, N.W. 1.

Wave Transmission Tools

A GREAT deal has been said recently about the application of Mr. G. Constantinesco's system of wave transmission of power. During the war the invention was made considerable use of for destructive purposes, being adapted to machine guns. It is now gaining prominence in industrial circles in connection with the speeding up of reconstruction. Tools are being operated by the new system with excellent results, especially in rock drilling. The invention is claimed to be an improvement on steam, electric, direct mechanical, compressed air, or hydraulic transmission of power.

Wave transmission is, in fact, the result of Constantinesco's discovery that water and other fluids have a much higher compressibility than physicists had previously attributed to them. Thanks to this, impulses, travelling at the speed of sound, can be set up in a column of any fluid—preferably water—and which are applicable to the work to be done. These impulses, generated by apparatus smaller and less costly than an air-compressor, transmit power to drive rock-drills or other mining appliances, and as the waves are not in any way impeded by motion of the fluid itself, the same water is allowed to flow through the hollow drill, to clear away *debris*, variable blows can be exerted.

The essential feature of the system is that the particles of the medium employed, whether solid, liquid, or gaseous, are in a state of vibration about a mean position.

According to the new system, energy is transmitted from one point to another, which may be at a considerable distance, by means of impressed periodic variations of pressure or tension producing longitudinal vibrations in solid, liquid, or gaseous columns. The energy is transmitted by periodic changes of pressure and volume in the longitudinal direction, and may be described as wave transmission of power or mechanical wave transmission.

As hitherto employed for the transmission of power in hydraulic and telpherage systems, liquid and solid connections have been considered as movable *en bloc*, and for practical purposes incompressible and inextensible. Both liquid and solid columns, however, are elastic, and this property can be made use of to transmit energy by vibrations of the particles of matter of which they are built up.

The Principle Explained

First consider the case of liquid columns. Assume that we have 150 metres of wrought-iron steam-pipe of 2·5 cm. diameter and 0·5 cm. thickness of metal, closed at one end and filled with water; and suppose a fluid-tight piston is forced into the pipe under a steady pressure of 35 kg. per square centimetre.

If the liquid were incompressible the increase in volume of the containing pipe under the pressure would allow the piston to enter about 1·3 cm. If the pipe were absolutely inexpansible the pressure would compress the water to an extent that would allow the piston to enter about 26 cm. It is seen, therefore, that the compression of the water in a wrought-iron steam pipe of the size considered is the chief factor in the changes of volume which take place under pressure, and that the expansion of the containing pipe is almost negligible.

On removing the pressure from the piston the water will again expand to its original volume. With other liquids similar results will be obtained. Assume now that the pipe, instead of being closed rigidly at one end, is closed by a light floating piston held always in contact with the liquid column, but free to move with the liquid; assume further that the working piston, instead of being slowly pushed into the pipe, is connected to a rapidly rotating crank, so that it moves with a simple harmonic motion, and that in addition to the piston impulses a steady pressure acts on the liquid column at both

ends. The only resistance to the movement of the piston is then the inertia of the liquid colu[mn] and if the column is short the liquid will move as a solid r[od]. If, however, the column is of considerable length, the motion of the layers of liquid nearer the working piston is resisted by the inertia of the more remote layers, and on the in-stroke of the piston the liquid in its neighbourhood will be compressed and its volume diminished; it follows that the motion of the layers of liquid remote from the piston will be less than that of layers nearer to it. At any given speed of rotation of the crank there will be a point in the liquid column at which, on the completion of the in-stroke of the piston, no movement of the liquid has occurred. The liquid between this point and the piston will at this moment be in a state of compression varying from a maximum at the piston to zero.

At the moment of maximum velocity of the piston, the velocity of the layer of liquid in contact with it will necessarily be greater than the velocity of the more remote layers, and the kinetic energy of the layers nearer the piston will, therefore, be transmitted in the forward direction along the column. The energy expended by the piston in its forward stroke at the end of this stroke is present in the liquid column, partly in the form of potential energy due to the decreased volume of the liquid under compression and partly as kinetic energy.

On the return stroke of the piston, the compression of the layer of liquid in contact with it decreases, and expansion of the liquid takes place between the piston and the point in the column at which the pressure is a maximum. As the point of

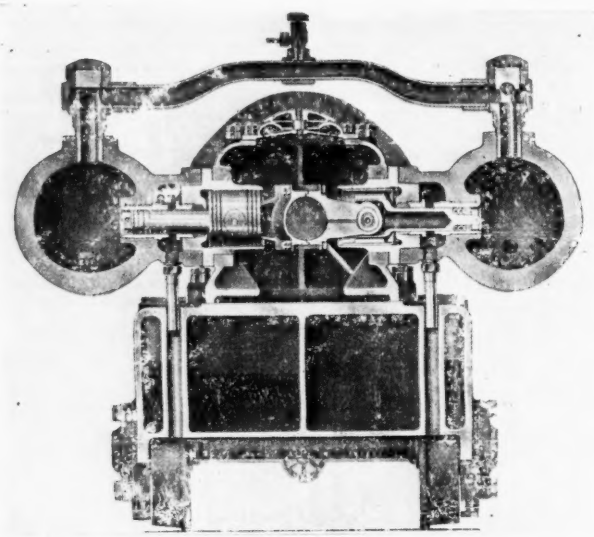


DIAGRAM SHOWING OPERATION OF WAVE-TRANSMISSION PRINCIPLE.

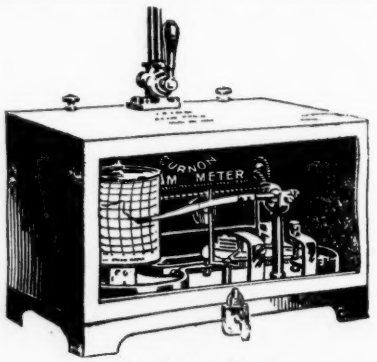
maximum pressure moves away from the piston at the commencement of the return stroke, the velocity of the layer of liquid in contact with the piston is reversed, while the pressure of this layer diminishes until the piston is at the end of its out-stroke. At the end of this out-stroke the layer of liquid in contact with the piston is instantaneously at rest. As the crank continues rotating, there are thus impressed on the liquid column a series of impulses sending a series of changes of pressure and volume along the column, the particles of liquid each vibrating about a mean position.

This method of transmitting power having been adapted to drilling and other tools, W. H. Dorman & Co., Ltd., of Stafford, the makers, claim that by power saving, low cost of maintenance and the fact that the capital outlay is reasonable, one of the great advantages of wave power transmission is economy. It is also convenient on account of mobile units, and the fact that the tools are reliable and foolproof. No special knowledge is required of the operative, and there is no delicate mechanism to go wrong. There are no risks of fire or explosion, and no facilities for great waste and unnoticed leakages, as with compressed air.

Meters, Calorimeters and Autoclaves

Steam Meters

IT is well known that a large proportion of the steam used for various manufacturing processes is wasted. Much of this waste occurs in ways not easily detected, and is therefore practically inevitable, unless the steam user has at his command convenient means for measuring the amount consumed at any point. Economical steam production has become a science in itself, and in many boiler-houses it would be impossible to effect any further saving, but, once the steam has left the boiler, science gives place to guesswork, and trouble begins. Especially is this so where steam is used for boiling and heating, as in bleachworks, chemical works, &c., where even periodical tests, expensive and unsatisfactory as they are, cannot always be arranged. Compare this with the case of the electrical engineer who is able to measure easily and exactly, at any time and at any point, the amount of power being consumed, and can thus ensure the utmost economy.



CURNO: STEAM METER.

The Curnon steam meter, made by Chas. W. Cook Ltd., of Manchester, makes practi[cable] this measurement which is essential to economy. In many works and factories one boiler very often supplies the steam for various machines and processes, and without some form of meter the owners have no means of ascertaining with any degree of accuracy the amount of steam that is being used in each case. This instrument both indicates and records on a chart the quantity of steam passing through a pipe in pounds per hour, whatever the variations of pressure and velocity, and without offering any obstruction to the flow. The principle upon which the meter operates is that of a Pitot tube. A plug is screwed into the steam pipe, and contains two bent tubes, one pointing against and the other with the flow of steam. The effect of the rush of steam past these tubes is to give a slight increase of pressure in one, and a corresponding decrease of pressure in the other. This pressure difference is made to operate a spring-controlled diaphragm, the movements of which give a measure of the velocity of steam. But the weight of steam passing also depends on the pressure, and this is measured by an ordinary Bourdon tube. The latter jointly with the diaphragm operates a linkwork, contrived so that the movement of the pen indicates the quantity of steam flowing at any instant. The diaphragm is contained in a circular box placed at the back of the meter, and spaces on either side of it are filled with water. A rotary spindle transmits the motion of the diaphragm to the linkwork. This is designed so that the stresses are symmetrically distributed between steel point bearings, thus allowing of a light, though rigid construction, and reducing friction to a minimum.

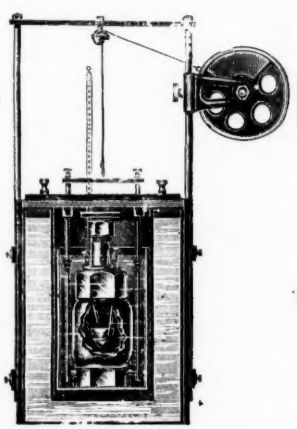
Bomb Calorimeters

The bomb calorimeter was first introduced by the late M. Berthelot, and was used by him in a long series of memorable researches upon the heat of combustion of organic compounds; this apparatus is now considered a necessary adjunct for research in all chemical laboratories. More recently Mahler modified the bomb with a view to making it suitable for general use in determining the calorific value of fuels; and, with still further improvements, the present form of apparatus has proved most successful in the hands of chemists and engineers in this country and abroad.

The consulting engineer engaged in making tests on boilers, gas generators, and other plant in which fuel is employed nowadays almost invariably finds it necessary to make an accurate determination of the calorific value of the fuel in the calorimetric bomb. In the general running of power stations or large private steam raising or gas producer plants, the engineer is rapidly adopting the only possible scientific method of control of the fuel supply, that of specifying and checking from time to time the calorific value of the fuel used in his plant.

It is to meet such requirements in this country that the Mahler-Cook calorimeter bomb, a production of Chas. W. Cook, Ltd., has been introduced. The bomb, of some 650 cubic cm. capacity, is made of mild forged steel of the highest quality, its thickness and shape being designed to ensure a high limit of safety. The inner surface is coated with a special enamel, or alternatively a platinum lining, to protect the steel against corrosion.

The cover, which carries the valve for the introduction of the oxygen, is provided with an insulated firing plug and platinum or nickel supports for the crucible and ignition wire, and is thickly gilt on its inner surface. This cover is connected to the main vessel by a powerful hexagon nut and special spigot joint, which allows the nut to be screwed up without turning the cover, and avoids tearing the lead joint. This design affords a simple and highly efficient means of mounting and dismounting the apparatus. Not only is the whole operation much shortened in this way, but the troubles which are so often experienced in making a gas-tight cover joint are entirely obviated.



BOMB CALORIMETER.

AUTOCLAVE.

The gas admission valve and the ignition plug, which are constant sources of complaint in other makes of calorimetric bomb, have also received special attention; they embody, as the result of many years' experience in the construction of high-pressure gas apparatus, several improvements, and with ordinary care and attention thoroughly reliable working is secured.

In preparing the bomb the cover is removed, and the small bottle or other vessel containing soda-lime or solid caustic alkali, which is placed in the bomb after each experiment for absorbing moisture, &c., is removed.

The platinum crucible is fixed firmly in the ring at the end of the thick electrode support wire, and small cylinders of the material under investigation are then accurately weighed (0·5 to 1·0 gram) and placed in the crucible. A coil of 10-15 cm. of the ignition wire* is then prepared by winding around a thin glass rod, the ends firmly fastened to the two stout conductors, and the central part of the coil is carefully arranged so as to come into actual contact with some of the material to be burnt, or alternatively by stretching the platinum wire between the two electrodes and hanging a piece of sewing cotton from wire down into crucible.

After these arrangements have been completed, the cover is placed in position, care being taken that there is no burr or grit on the lead washer,* and is then tightened up by the ring spanner provided for that purpose. During this operation the bomb is held in position in the cast-iron hexagon foot, which should be screwed down to some bench or other stand.

By means of the union cone and nut and copper tube the bomb is then connected to the gradual release valve and gauge screwed into the cylinder. The inlet valve on the bomb is opened and the gradual release valve closed; then the oxygen cylinder valve is opened. The gradual release valve is now slowly opened and gas allowed to enter the bomb. It is important to avoid a rapid inrush of oxygen, since otherwise the material is liable to be blown out of the crucible, and thus, of course, would escape burning. The pressure in the bomb is allowed to rise to 20-25 atmospheres, at which point the gradual release, cylinder and bomb valves are closed and the gas connections removed.

Should a slight leak be observed either at the gas inlet connection or at the insulated plug, it can be readily stopped by gently tightening up the corresponding screws. With proper precautions the bomb will retain the gas under pressure for long periods, and although slight leakage does not necessarily interfere with the success of the experiment, the user should not be satisfied unless he can keep his apparatus practically gas-tight.

Autoclaves

The dyeing and allied industries offer an almost unlimited field for many kinds and types of machines and vessels required for the processes involved in the production of dyes, explosives, chemical and bacteriological work, &c., and as much of this work is of a highly dangerous character, it is necessary that both the designer and maker shall be possessed of special knowledge and qualifications gained by long experience and actual association with the many difficulties encountered by those accustomed to the pactical working of this class of plant.

All apparatus coming under the classification of autoclaves, and used for increased internal pressures and temperatures should be designed with a view as to suitability of metal for the purpose required, strength of metal for desired pressure and temperature, and shape and strength of the various parts and accessories. The instrument illustrated is made by Chas. W. Cook, Ltd., who claim to possess all the qualifications mentioned.

A New Pulfrich Refractometer

As is well known the Pulfrich Refractometer gives values of Refractive Indices to a very high degree of accuracy with the minimum amount of calculation, as it eliminates the necessity of having to make angular measurements of the material under test. The Pulfrich Refractometer, which was previous to 1914 supplied principally by Continental firms, possesses several defects which prevented the theoretical accuracy of measurements being obtained, and in view of this this new instrument has recently been constructed by Bellingham & Stanley, Ltd., on the lines suggested by Mr. Guild of the National Physical Laboratory.

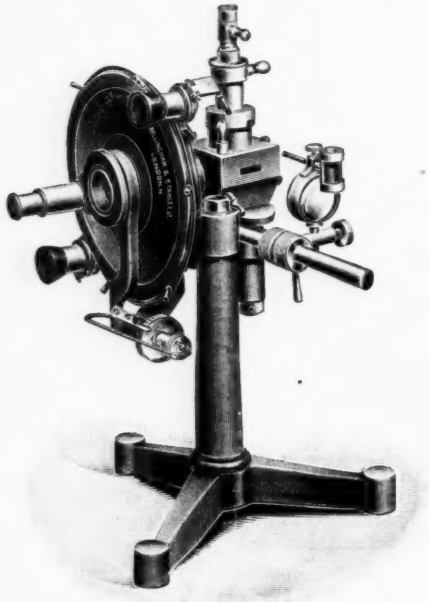
The Pulfrich Refractometer previously in use was equipped with a Prism block of 90 degrees angle. This prevented any absolute value of the Refractive Index of the block being obtained, and in consequence the block had to be calibrated by means of quartz or other substance, the refractive indices of which were often in doubt, besides introducing an additional set of calculations which were undesirable. In the new instrument the 60 degree prism block has been used which allows of its refractive index being determined for light of any wave length directly against air and without the use of any secondary standards. Further, as the light on the material under test strikes the emergent face of the prism block at angles which are all nearly normal to the face, a much larger beam of light enters the observation telescope and results in a considerable

* Very fine platinum wire (0·0035 in. diameter) must be used, no other wire is satisfactory.

* Should the lead project above the groove, as it is apt to do on account of the frequent compression, it may be trimmed off with a sharp penknife; on the other hand, the joint may after long use require re-packing. This may easily be carried out by fitting a small piece of lead wire so as to form a complete circle in the socket, the ends being trimmed to make the thickness at their junction uniform with the rest of the wire.

gain in brilliance and resolving power. The mechanical design has also been considerably improved, and in the new instrument the divided face of the circle is about 7 in. in diameter and is read by double verniers to eliminate any want of centring in the circle. All the adjustments which had been found necessary in the practical use of the instrument have also been included.

In the instrument shown an efficient water jacket has been provided both to the Prism Block and to the cell which is used for containing any solution of which it is desired to measure the Refractive Index, but for most accurate measurements the instrument should be used in a constant temperature room instead of relying upon any system of auxiliary heating. The dispersion measurements for liquids or solids can either be obtained by direct reading of the circle or by the use of the micrometer screw shown. This micrometer screw is fitted with a constant tension spring embodied in the nut, and any



PULFRICH REFRACTOMETER.

backlash present is taken up by the spring. This method is greatly to be preferred over the old-fashioned spring box and plunger which are sometimes employed as, owing to the pressure on the screw being greater at one end of its travel than at the other, an unequal wearing of the thread results which causes a considerable loss of accuracy. In addition to the instrument shown another modified type of Pulfrich Refractometer is being constructed by the same firm. This instrument is designed for the accurate measurement of the Refractive Indices of Optical Glass. This is a somewhat simpler form but retains the same degree of accuracy of measurement.

Copper and Sulphur Ores of Quebec

DURING the year 1919 the mines of copper and sulphur ores of the Province of Quebec shipped 53,965 tons, valued at $447,623. The copper contents of the ore shipped amounted to 5,751,188 lbs. A substantial proportion of this metal is to be credited to the shipments of high-grade ore. The great majority of the pyritous-copper ores of the Province of Quebec consist of copper-bearing iron pyrites, which are used for the manufacture of sulphuric acid, the residual cinder being then treated for the extraction of copper. They were, therefore, essentially "war minerals."

Mr. H. W. Gardner, B.A. (Cambridge), has been appointed assistant lecturer, and Mr. F. Knowles (assistant analyst at the Midland Agricultural and Dairy College) assistant analyst, in the chemical department of the East-Anglian Institute of Agriculture, each at a salary of £350, rising to £450.

Chemical Matters in Parliament

Anti-Dumping Bill

SIR ROBERT HORNE, President of the Board of Trade, replying to Sir K. Fraser (House of Commons, November 18), said that it would not be possible to introduce legislation dealing with dumping during the present Session. As regards the second part of the question, prohibitions of importations were imposed during the War, not under the Defence of the Realm Act, but under Section 43 of the Customs Consolidation Act, 1876. The Courts had since decided that this Section could not be utilised for the purpose in question.

Colonel Lowther: Is it not the fact that many of our industries, notably the glass industry, are suffering terribly from this delay? Can nothing be done to expedite the delay?

Sir R. Horne: I think the hon. Member is under a misapprehension. This has nothing to do with dumping.

British Oil Companies, Baku

The Prime Minister, replying to Major Barnett (House of Commons, November 18), said: The issues raised will certainly be considered when the question of including a formal peace with Russia comes to be negotiated. I may point out further that Baku is situated in Azerbaijan, which claims to be an independent Soviet Republic.

Major Barnett: Is my right hon. Friend aware that the 11th Soviet Army Corps occupied Baku on 27th April, and is in occupation of it to-day?

The Prime Minister: No, I am not aware of it.

German Dyes

Sir R. Horne, President of the Board of Trade, replying to Major Barnes (House of Commons, Nov. 22) said the amount of German dyes delivered in this country were 550 tons last year, and about 1,050 tons to the end of October this year.

Major Barnes: Are the kinds of dyes that come in selected, and, if so, by whom?

Sir R. Horne: I am afraid I cannot answer that. The dyes which are coming in are those which are of use to the trade.

Employment in Lead Processes

In the House of Lords on November 18 the Women and Young Persons (Employment in Lead Processes) Bill was brought up from the Commons and read a second time.

Gas Fumes in Works

At an inquest at Huddersfield with regard to the death of Christopher Farrell, a chemical labourer at the British Dyestuffs Corporation, Ltd., it was stated that Farrell had been employed neutralising tubs with hydrochloric acid. One of the tubs frothed and Farrell is believed to have inhaled some fumes from it. Respirators were provided for the men on this work. The chemist in charge of the benzoline shed said it was considered possible that a poisonous gas could be given off during the process and that was the reason for an elaborate fume chute system. Dr. W. H. Smailes said the poison could have entered the body either through the skin or by inhalation. The symptoms described might be those of gassing, but also of pneumonia. The Coroner said the man died from the effects of some poisonous gas which he inhaled and the probabilities pointed to it being arseniuretted hydrogen. There was no evidence of any negligence, the process was properly carried out, and death was accidental.

Alsatian Potash

FRENCH potash salts are still being offered at the lowest market prices. During the past month a good deal of French kainit 14 per cent. and of French potash salts 20 per cent. has been used for the autumn-sown crops of wheat and oats, and also for the manuring of grass land. French kainit 14 per cent. gave a good account of itself on grass land last season. Many farmers believe in the spring application of kainit, but the best results are got from kainit which has been applied in the late autumn or winter. The Alsatian mines are now supplying French kainit 14 per cent., French manure salts 20 per cent. and 30 per cent., muriate of potash 50 per cent. and 60 per cent., and sulphate of potash 90 per cent.

At a sitting of the Railway Rates Committee in London on Wednesday, evidence was given by Major-General S. S. Long, managing director of Lever Brothers, and Mr. J. H. Fitton, transport manager for British Dyestuffs Corporation, Ltd.

From Week to Week

Bulgaria has been added to the list of countries for which credits may be obtained under the Overseas Trade (Credits and Insurance) Act, 1920.

Shanghai received from Germany during the last month Hk.Tls. 147,875 of aniline dyes. Germany's trade with China is said to be slowly but steadily increasing.

"Rare Gases in the Atmosphere" was the subject of a lecture by Professor J. Norman Collie at University College, Gower Street, on November 19.

Seventy per cent. of the students trained at the Welsh College of Pharmacy, Cardiff, have passed the qualifying examination of the Pharmaceutical Society of Great Britain.

Crushed between a motor-car and an island refuge, Mr. Ernest Waterhouse, chemist, of Mare Street, Hackney, son of Mr. Fletcher Waterhouse, chemist, of 2, Gaythorpe Road, Bradford, was killed in Shaftesbury Avenue, London.

Rubber and Tropical Products fifth international exhibition, under the patronage of the King, will be held in June next. Thirty-six British and foreign Governments will be represented.

Professor Maurice Debové, permanent secretary of the Academy of Medicine, and one of the best known medical scientists in France, has died at the age of 79. He was a pupil of the celebrated Dr. Charcot.

Well known and highly esteemed in Arbroath, Mr. Andrew Naysmith, retired chemist, died on November 15 at the age of 63. Mr. Naysmith accompanied an expedition which in 1911 proceeded to the Falkland Islands to engage in research work.

Before a large audience, Mr. Sydney Jamieson lectured on "Petroleum from the Wells to Pharmacy" on Monday, November 15, under the auspices of the Dundee branch of the Amalgamated Society of Pharmacists.

Through the bursting of a tank at Glamorgan Collieries By-Products Works, Rhondda, on November 18, Evan David Lloyd, an assistant analytical chemist, was killed instantly. The explosion blew a portion of the building through the laboratory roof.

Certus cold glue powder is a dry compound which, mixed with cold water, produces a solution of glue or cement. Readers of THE CHEMICAL AGE may obtain a free sample on application to the makers, Central Chemicals, Ltd., 8-10, Little Suffolk Street, S.E.1.

Mr. G. Scott Robertson, head of the Chemical and Analytical Department of the East Anglian Institute of Agriculture at Chelmsford, has been elected by the Senate of Queen's University, Belfast, to the newly-created lectureship in agricultural chemistry.

Since the Aquitania has used oil as fuel she has employed 200 fewer firemen. Formerly three firemen, and at least three trimmers, were required for each fire. At present a fireman has nine fires under his charge, but shipowners believe that one man could manage from 12 to 16 fires.

Samples have been sent to the British Dye Committee of a vegetable dye made by two South Africans. It is possible the new dye, which comes from Capetown, will have a revolutionary effect upon the whole of the industry. It is a direct substantive dye, to be used with cold water only, the material being simply soaked for less than ten minutes in a cold dye solution, and it is stated to be non-injurious to any fabric.

Herr Neuberg, who fled to Switzerland in 1918, is now employed in the fine chemical industry of that country. It was this German chemist who found a way to derive glycerine from sugar in large quantities, thus dispensing with all anxiety about Germany's supply of glycerine for explosives when fats were no longer procurable owing to our blockade. Herr Neuberg, we understand, has taken his patents with him.

In reference to a paragraph in THE CHEMICAL AGE of last week respecting the change of editorship of the *Analyst* and the *Journal of the Institute of Brewing*, the facts are that in June last Mr. Julian L. Baker was appointed editor of the *Journal of the Institute of Brewing*. Mr. Baker will resign the editorship of the *Analyst* at the end of this year, and the Council of the Society of Public Analysts and Other Analytical Chemists have appointed Mr. C. A. Mitchell to succeed him.

A fire broke out on Monday, November 22, in the engine-room of oil-tanker "Winnebago," in Ramsden Dock, Barrow. She is owned by the Anglo-American Oil Co. There was considerable alarm, as she was lying alongside a tanker discharging petrol to the storage tanks close by. Two fire engines from the Barrow Corporation, one from Vickers and one from the Furness Railway Co., were in attendance. The fire was put out largely with the help of sand. The "Winnebago" had just discharged a cargo of oil.

It is reported in the German Press that an important discovery of oil has been made near Hamburg. The oil is said to lie at between 150 and 250 metres. Professor Guerich, the head of the Mineralogical and Geological Institute at Hamburg, has reported most favourably on the discovery. Samples of the oil, which were taken from pits only a metre deep, yielded on analysis 30 per cent. of good quality petroleum, about 45 per cent. of first-class lubricant and 25 per cent. of utilisable residues. Large quantities of oil have not yet, however, been found.

Professor Willaman, of the University of Minnesota, urges in the *American Journal of Science* that attention should be paid to the commercial production of fruit sugar, fructose or lævulose. Glucose and maltose, it is stated, are very much less sweet than sugar from cane beet. Fructose, on the other hand, is the sweetest known sugar. The most promising source is from the Jerusalem artichoke, the fresh tubers of which contain from 12 to 14 per cent. of inulin. Professor Willaman hopes to direct the notice of the technical chemists to research on these processes.

"Lubrication" was the subject of a lecture delivered on Tuesday, November 16, before the Hull Chemical and Engineering Society, by Mr. T. A. Nightscales. The relation between the viscosity and specific gravity of oils and their lubricating properties were dealt with and explained. The sources and composition of various oils and greases used in lubrication were described and the methods of testing them discussed from both the chemists' and engineers' point of view. Frictional testing machines were described in some detail, with the method of working them, and some results obtained by their use. In conclusion, the lecturer touched on the recent "germ theory of lubrication."

Circular letters are being sent to a large number of English speaking chemists by the American Chemical Society, calling attention to the work of the society, which now consists of 15,500 chemists. Any one who has already been accepted for membership on one of the Britith chemical societies will be required to furnish no further introduction or recommendation for membership in the American society. Those who wish to join, and receive the society's three journals—*Journal of the American Chemical Society*, *Journal of Industrial and Engineering Chemistry* and *Chemical Abstracts*—are invited to send $17.50 payable in American exchange, to 1709, G Street, N.W., Washington, D.C., U.S.A.

On November 19 a conference of delegates of the National Federation of General Workers connected with the aluminium industry was held in London. The impasse which has arisen on the wages question was considered. A communication had been received from the two employers' associations—The British Aluminium Co., Ltd., and the Aluminium Corporation, Ltd.—that they had no evidence that the employees were not content with their present wages and conditions, and that they had decided to abandon the projected Joint Central Committee for dealing with the wages question. It was decided to consult the affiliated unions as to what action should be taken.

The oil-producing interests of Great Britain have contributed £122,850 towards the £500,000 for which the University of Birmingham is issuing an appeal. The Anglo-Persian Oil Co., the Anglo-Saxon Petroleum Co., Viscount Cowdray, and Sir Marcus Samuel contributed £25,000 each, Mr. D. Elliott Alves £12,500, the Anglo-American Oil Co. £10,000, the Central Mining & Investments Corporation £250, and the Trinidad leaseholds, Ltd., £100. These large donations suggest an estimate of the value placed upon the work the University of Birmingham is undertaking in research and in the training and equipment of oil-mining engineers. Under the direction of Sir John Cadman, it is stated that the School of Mining at Birmingham has established an enviable position.

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GASES. Inflammability of jets of hydrogen and inert gas. P. G. Ledig. *J. Ind. Eng. Chem.*, November 1, 1920, pp. 1098-1100.

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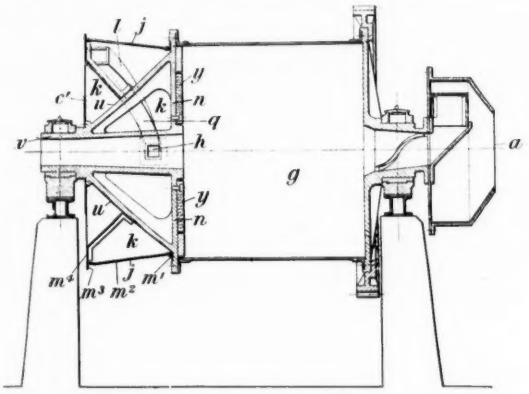
Patent Literature

Abstracts of Complete Specifications

152,724. ORES, MINERALS AND THE LIKE, MACHINES FOR GRINDING. J. R. Broadley, 300, Alexandra Park Road, Alexandra Park, London, N.22. Application date, July 8, 1919.

The object is to facilitate the return to the grinding chamber of material which has not been ground to the requisite degree of fineness. Material to be ground is supplied through the vessel *a* to the grinding chamber *g*, and the ground material passes through the grid *y* and supporting plate *n* to the screening chamber *k*. The grid plate *n* is made integral with the hollow trunnion *v*, and the structure is made rigid by supporting ribs *u*. The finer material passes out through



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the peripheral screen *j* and the coarser particles of ore pass into the open outer end of the shoot *l* at each revolution, and are returned to the grinding chamber through the port *h* and the central aperture *p*. The shoot *l* is enclosed for a portion of its length by the plate *q* and passes through the screening chamber *k* in an involute curve as shown. The return of the material through the hollow trunnion *v* may be facilitated by internal screw vanes. The screening compartment *k* may be attached to the plate *n* by a frame comprising an angle ring *m'* having longitudinal arms m^2, which are connected to another ring, m^3 and annular plate m^4. A splash plate, *c'*, may be attached to the boss.

152,740. HYDROGENATION PROCESSES, METHOD OF APPLYING NICKEL CARBONYL IN. R. Lessing, 317, High Holborn, London. Application date, July 15, 1919.

In hydrogenating unsaturated organic compounds carbon monoxide containing nickel carbonyl is used, the nickel carbonyl being produced by passing a large excess of carbon monoxide over finely divided nickel. The object is to avoid the use of a large excess of carbon monoxide in the hydrogenation process, which is undesirable. This is effected by using different gases in separate cycles for the two phases of the process. The carbon monoxide containing nickel carbonyl is passed through a tower scrubber charged with an inert porous material impregnated with an absorbent for nickel carbonyl, such as ground nut oil. Alternatively, an absorbent such as activated charcoal which has been heated in hydrogen or steam, or other porous material, such as clay, alumina, fuller's earth or kieselguhr may be used. The carbon monoxide is then returned to the nickel volatiliser. The hydrogenating gas is then passed through the absorbing tower to absorb the nickel carbonyl for use in the hydrogenation process. The diluent effect of free carbon monoxide and any side reactions due to it are thus avoided.

152,741 DESTRUCTIVE DISTILLATION OF WOOD, WOODY FIBRE AND SIMILAR CARBONACEOUS SUBSTANCES. P. Poore, 1-4, Paternoster Row, London, E.C. Application date, July 15, 1919.

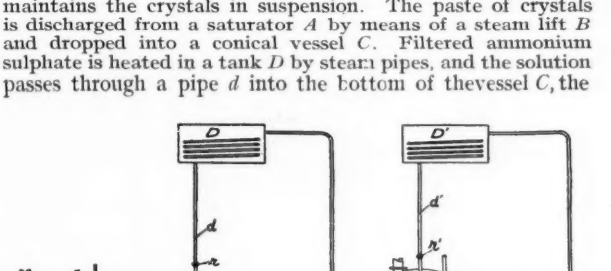
The object is to secure a high yield of acetic acid, wood naphtha, &c., by the destructive distillation of wood and the like. The wood is distilled in stationary cylindrical retorts, heated externally, into which steam superheated to 180°C.–270°C. is admitted at the bottom through a pipe extending downwards through the retort as described in Specification 131,006. The wood is first dried to reduce its moisture content to 5–10 per cent., and the steam is not admitted till the temperature has been raised above 100°C. Alternatively, a rotary cylindrical retort such as that described in Specification 141,417 may be used.

152,752. ZINC SOLUTIONS, TREATMENT OF. F. Peterson, 28, Victoria Street, London, S.W.1, and The Metals Extraction Corporation, Ltd., Finsbury House, Blomfield Street, London, E.C.2. Application date, July 17, 1919.

The object is to remove dissolved silica from zinc salt solutions obtained by treatment of zinc ores. Ground zinc sulphide ore is calcined to oxidise the zinc to zinc oxide and sulphate. The re-ground product is gradually added to hot acid liquor obtained from the electrolytic cells from which zinc has been deposited, and which contains 10–15 per cent. of sulphuric acid. When the acidity is reduced to about 0·5 per cent., it may be further reduced to obout 0·1 per cent. by adding a precipitate containing zinc hydrate, zinc carbonate and ferric hydrate obtained from a subsequent stage. Ground calcium carbonate is then added to complete the neutralisation. Gelatinisation of the dissolved silica with the resultant difficulty in filtering is avoided by adding a further 10 lbs. of calcium carbonate (*e.g.*, whiting) per ton of liquor. The mixture is heated to 90°C.–100°C. with agitation, when the silica is precipitated in a form in which it is readily filtered and washed.

152,766. SULPHATE OF AMMONIA, MANUFACTURE OF. R. Lessing, 317, High Holborn, London, W.C.1. Application date, July 21, 1919.

The coloured impurities which are usually contained in commercial sulphate of ammonia may be removed by agitating the crystals with a clear saturated solution of sulphate of ammonia containing some free acid. The washing is effected by an upward current of the solution of sulphate of ammonia, which maintains the crystals in suspension. The paste of crystals is discharged from a saturator *A* by means of a steam lift *B* and dropped into a conical vessel *C*. Filtered ammonium sulphate is heated in a tank *D* by steam pipes, and the solution passes through a pipe *d* into the bottom of the vessel *C*, the



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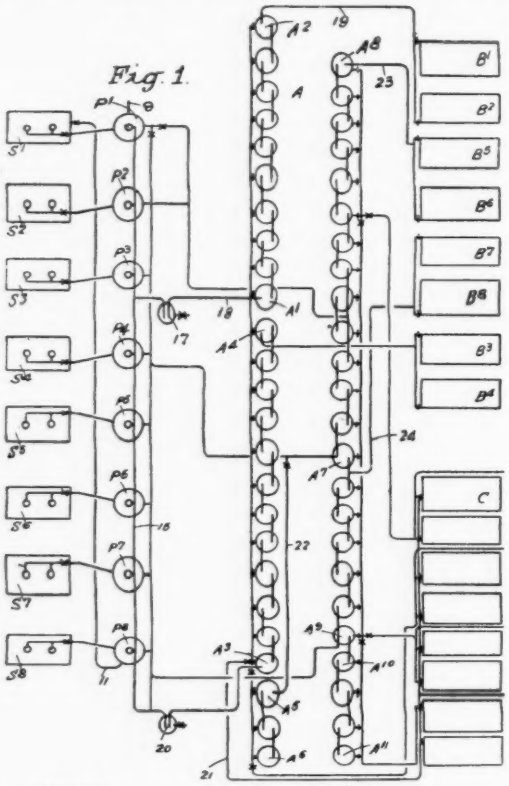
velocity being regulated by a valve *r*. The solution rises with decreasing velocity, due to the shape of the vessel, and overflows into an annular launder *E*, and then passes through a pipe *p* to a steam-heated filter tank *F*. The solution is returned to the tank B by an air lift *G*. It has been found that the coloured impurities are present only on the surface of the sulphate crystals, and that they may be entirely removed by this process without any loss of the sulphate, which is obtained perfectly white. In a modification the process may be carried out in a suitable type of saturator without using a separate vessel *C*.

152,791. PETROLEUM OR OTHER HYDROCARBONS, OR MIXTURE OF VOLATILE LIQUIDS, CONTINUOUS DISTILLATION, AND CONTINUOUS FRACTIONATION OF. H. L. Allan, 46, Park Circus, Ayr, Scotland. Application date, July 24, 1919.

The apparatus comprises a series of stills, S^1 to S^8, a series of preheaters, P^1 to P^8, a series of atmospheric condensers, A, a series of condenser tanks, B^1 to B^8, and a series of cooling tanks, C. Crude oil is supplied to the preheater, P^1, through the pipe 9, where it is heated by vapour from the still, S^1, and then passes in succession through the remaining preheaters, through which the vapour from the other stills passes. Vapour from the preheaters passes through the pipe 15, 18, to the atmospheric condenser, A^1, and then in succession to the condenser, A^2. Condensed petrol passes to the tanks, B^1 B^2. Vapour from the preheaters, P^5—P^8, which may contain heavier fractions, together with vapour from the stills, S^1, S^2, may be diverted through the catch pot 20 to the condensers, A^3, A^4, and the product passes into the light benzine condenser tanks, B^3, B^4. The condensate from the condensers, A^1—A^2, flow backwards in cascade, and then through A^4 to A^3, where



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it is re-evaporated. The vapour passes finally to the condenser tanks, B^3, B^4. The kerosene enters the atmospheric condensers at A^1 and A^2 with the vapours from the preheaters, and is left in the units so that it may be continuously withdrawn through the pipe 21. If the kerosene is passed through additional condensers, A^5—A^6, through which steam is also passed, a high flash kerosene may be withdrawn at A^6. The vapour from A^5—A^6 is passed through the pipe 22 to the condensers A^7. Vapour from the stills, S^3, S^4, is passed through preheaters, P^3, P^4, to the condensers, A^7, and the kerosene is fractionated in the condensers, A^7—A^8. The uncondensed vapour passes through the pipe 23 to the tanks B^3, B^6. The vapour from the stills, S^5—S^8, is similarly treated. The preheaters and the stills consist of cylindrical vessels divided horizontally into three compartments, the two uppermost being separated by two tube plates slightly separated. A series of tubes extends through the middle compartment, and another series open at the top extend upwards into the upper compartment. The oil enters the lower compartment, passes upwards through the tubes in the middle compartment, and finally overflows at the top of the tubes in the upper compartment into that compartment. The oil then passes to the bottom of the next unit. The heating medium surrounds the tubes in the middle compartment.

152,879. ELECTROLYTIC APPARATUS. E. A. Ashcroft, 65, London Wall, London. Application date, July 9, 1919.

The invention consists in the double cell electrolytic apparatus which was described in specification 152,402 (*see* THE CHEMICAL AGE, Vol. III., page 567) for the electrolysis of magnesium chloride. It is applicable also for other electrolytic processes.

152,887. SULPHUR FROM SULPHIDE ORES, EXTRACTION OF. H. C. Pedersen, Post Box 189, Trondhjem, Norway. Application date, December 10, 1919.

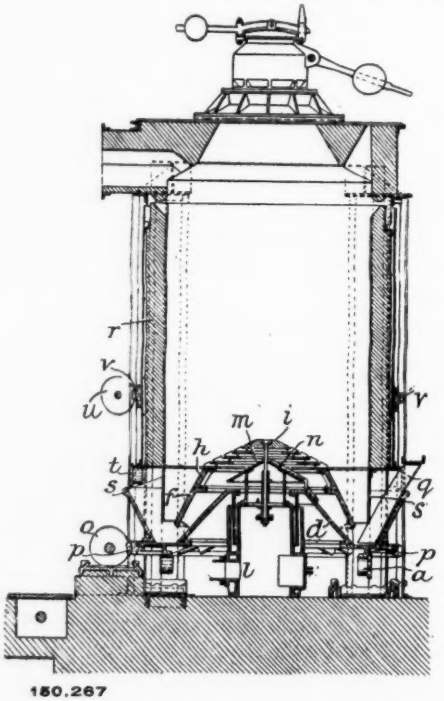
Sulphide ore, such as ordinary pyrites, is mixed with coke and roasted with the usual quantity of air. In the central part of the furnace the sulphur dioxide from the lower part is reduced to sulphur, and the coke is burnt to carbon dioxide. The hot gases distil sulphur from upper layers of pyrites, and in the lowest zone the pyrites is oxidised to iron oxide and sulphur dioxide is liberated. The final products are thus ordinary calcined pyrites and sulphur. The roasting is effected in a shaft furnace, and the quantity of air introduced is so proportioned to the height of the charge that the reactions indicated above take place.

NOTE.—Specification 139,753 (Fredriksstad Elektrokemiske Fabriker Aktieselskabet) which is now accepted, was abstracted in THE CHEMICAL AGE when it became open to inspection under the International Convention. It relates to the manufacture of sodium perborate. *See* Vol. II., page 537.

International Specifications Not Yet Accepted

150,267. GAS PRODUCERS. E. Hilger, 13, Schadow Platz, Dusseldorf, Germany. International Convention date, August 16, 1919.

The shell, r, of a gas producer, and the grate and ash pan are mounted on separate sets of rollers, t, a, and are driven by



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worm gearing, u, v, and o, p, respectively. The rotation of the two parts may be in the same or in opposite directions, and at the same or different speeds. The ash pan is provided with a conical portion, d, which carries the conical members, h, f, supporting the grate, i. Clinker is broken up between the

parts, *h*, *f*, and the wall, *s*, of the producer, and discharged through a fixed shoot, *q*. A scraper, *n*, removes ashes from the hood, *m*.

LATEST NOTIFICATIONS.

153,887. Neutralising oils and fats. Soc. Rocca, Tassy, et De Roux. November 13, 1919.
153,598 Process of and apparatus for producing pulp for making paper. A. Courrier, November 11, 1919.
153,603. Process for compressing vapour in multi-stage centrifugal compressors. Akt.-Ges. Der Maschinenfabriken Escher, Wyss, et Cie. November 10, 1919.
153,605. Process for the preparation of terpineol. Marchant, R November 10, 1919.
153,606. Process for preparing terpin hydrate. Marchand, R. November 10, 1919.

Licence of Right

Notice has been given that requests have been made that the following patents should be indorsed "Licences of Right," under Section 24 of the Patents Act: 9,051/1915 (Chemische Fabrik Brugg Akt.-Ges.) relating to a process for chemically drying centrifugal ammonium bicarbonate; and 15,749/1915 (Imray, *Society of Chemical Industry in Basle*), relating to the manufacture of products containing radium pyrophosphate and active oxygen.

Specifications Accepted, with Date of Application

126,311. Chlorhydrins or bromhydrins, Process and apparatus for the manufacture of. Commercial Research Co. May 3, 1918.
126,646. Oxysalt compositions, and processes of making same. C. Catlett. May 9, 1918.
132,489. Coal-carbonizing furnaces. H. L. Doherty. Sept. 7, 1918.
137,300. Fractionating apparatus. Rosanoff Process Co. December 23, 1918.
138,362. Wood-gas Producer. L. Avellana. January 28, 1919.
138,594. Chrome alum, Process for manufacturing. G. H. Hultman. February 6, 1919.
143,885. Anthraquinone, Process for the purification of. Kinzlberger & Co. September 20, 1917.
146,869. Pyridine bases, manufacture of. Farbwerke vorm. Meister, Lucius & Bruning. June 22, 1917.
147,908. Ethylene chloride, process for the production of. T. Goldschmidt Akt.-Ges., and O. Matter. July 22, 1915.
153,343. Rubber, manufacture of. P. Schidrowitz, W. Feldenheimer and W. W. Plowman. June, 2, 1919.
153,352. Aluminium hydrate, process of, and apparatus for precipitating. R. S. Sherwin. July 8, 1919.
153,362. Nitric acid, manufacture of. A. Henwood. July 29, 1919.
153,434. Fertilizers, and their method of manufacture. W. H. Hyatt and E. N. Fellowes. September 26, 1919.
153,481. Ores or the like, apparatus suitable for the water concentration of—or for similar purposes. W. M. Martin. December 16, 1919.
153,494. Phenolic aldehyde condensation products, process for the preparation of. A. T. Birkby and F. E. Birkby. January 13, 1920.
153,500. Oxide of aluminium from chloride of aluminium, Process of producing. S. E. Sieurin. January 19, 1920.
153,503. Ores and the like, process and apparatus for washing. C. A. Edgley. February 3, 1920.
153,520. Saccharin, process for the manufacture of. Soc. Chimque des Usines du Rhone. January 24, 1920.

Applications for Patents.

Akt.-Ges. der Maschinenfabriken Escher, Wyss, et Cie. Cooling-devices of multi-stage centrifugal compressors. 32,489. November 17. (Switzerland, December 8, 1919.)
Aktieselskapet Cellulosepatenter. Centrifugal pumps. 32,583 November 18. (Norway, March 14, 1917.)
Ball, F. L. Caps for liquid-fuel containers. 32,634. November 18.
Barrie, W. S. Aromatic hydrocarbon cement. 32,456. November 17. (Australia, May 27, 1918.)
British Dyestuffs Corporation. Manufacture of a chlorinated naphthalene derivative. 32,241. November 15.
" Manufacture of azo colouring-matters and an intermediate for use therein. 32,242. November 15.
Chemische Fabriken Worms Akt.-Ges. Manufacture of tanning-materials. 32,457. November 17. (Germany, November 18, 1919.)
Clark & Co., R. I. Heat treatment of oils, &c. 32,250. November 15.
Dennington, R. C. Treating wood. 32,598. November 18.
Edwards, F. W. Apparatus for mixing liquid with powder. 32,672. November 19.
Erste Brünner Maschinenfabriks Ges. Rotary compressors and centrifugal pumps. 32,612. November 18. (Austria, August 3.)
Gibson, W. Manufacture of a chlorinated naphthalene derivative. 32,241. November 15.
Harrison, G. (Dow Chemical Co.). Electrolytic cells. 32,208. November 15.
Leysieffer, G. Production of plastic bodies resembling vulcanised rubber. 32,496. November 17. (Germany, March 19, 1919.)
Maclaren, A. F. Production of ferro-alloys. 32,498. November 17.
McLennan, A. Treatment of leather with india-rubber. 32,680 November 19.
Merck, E. (Firm of). Preparation of tropine mono-carboxylic acid testers. 32,349. 32,350. 32,351. November 16. (Germany, August 23, 1919.)
Muchka, J. Production of gas mixtures of nitrogen and carbonic acid deficient in oxygen. 32,341. November 16. (Austria, December 3, 1917.)
Parr, C. E. Desulphurising hydrocarbons, &c. 32,195. November 15.
Pearson, R. Desulphurising hydrocarbons, &c. 32,195. November 15.
Robinson, R. Manufacture of a chlorinated naphthalene derivative. 32,241. November 15.
Tervet, J. N. Heat treatment of oils, &c. 32,250. November 15.
Thorssell, C. T. Production of pure nitrogen. 32,360. 32,361. November 16. (Sweden, December 19, 1919.)
Wilson, H. J. Distillation of fuels, shales, &c. 32,458. November 17.
" J. L. Distillation of tar and oils. 32,391. November 17.
Wolfes, O. Preparation of tropine mono-carboxylic acid esters. 32,349. November 16. (Germany, August 23, 1919.)

Western Australian Alkali Deposits

Brunner, Mond & Co.'s New Enterprise

AN official report from the Minister of Industries of Western Australia to the Agent-General for that State in London says that Brunner, Mond & Co. (England) have become so interested in the value of the alkali deposits in Western Australia that they have requisitioned the services of Professor Woolnough of the University of Western Australia to advise them on a proposal to erect alkali works in the State.

Huddersfield Chemical Society

HUDDERSFIELD Technical College Chemical Society held its second meeting at the College, on November 19, when two lectures were delivered by students. The first lecture, on "Liquid Air," was given by Miss M. G. Templeton, who dealt with the history of the attempts to liquefy air, and the general principles underlying the manufacturing processes. Experiments were made and mercury, alcohol and benzine were frozen, while grapes, flowers and soft rubber tubing became quite brittle by immersion in liquid air. The second lecture was given by Miss S. S. Eagland on "Fireworks." The lecturer defined pyrotechny and described the manufacture of fireworks.

Restoration of An Appeal

THE Court of Appeal on Monday granted an application by the Mersey Chemical Works, Ltd., for the restoration of an appeal by them in an action against Levenstein, Ltd., for alleged infringement of a patent. Originally the action was brought by the Mersey Chemical Works and the Aktiengesellschaft fur Anilin Fabriken in Berlin, but the German Company now desired to be dismissed from the action on the ground that they had no further interest in the matter.

A direction was given that the Mersey Chemical Company's appeal should not be heard during the present sittings.

Recent Wills

Mr. E. R. Blundstone, Heathfield, Hampton Hill, Middlesex, and of York Street, Westminster, London, S.W., consulting chemist..... £8,788

Books Received

THE YEASTS. By Alexandre Guilliermond. London: Chapman & Hall. Pp. 424. 33s. net.

NUCLEIC ACIDS, THEIR CHEMICAL PROPERTIES AND PHYSIOLOGICAL CONDUCT. By Walter Jones. London: Longmans, Green & Co., pp. 150. 9s. net.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, November 23.

There is very little change to report in the condition of the chemical market generally. Trade still continues extremely quiet, and business is only being done on a hand-to-mouth basis. Considering the extreme slackness, it is remarkable how values are maintained, although, naturally, with the lack of demand, quotations continue to rule in buyers' favour. Quite a number of buyers are now inquiring for forward contracts, and we understand that some substantial business has been placed for next year's delivery at current figures.

There is nothing fresh to report as regards export, and trade continues very quiet, except for one or two commodities. There is a general feeling, however, that markets are nearing the bottom, and perhaps therefore there may be a revival in demand earlier than is anticipated in some quarters.

General Chemicals

ACETONE is rather quiet, but prices well maintained.

ACID ACETIC is in small demand, but the price is slightly easier. Arrivals, however, are very light.

ACID CARBOLIC is without feature, with practically no trade passing.

ACID FORMIC is rather slow, but prices are maintained.

ACID OXALIC is extremely slow, but there does not appear to be much reduction in price.

ACID TARTARIC is in quite good inquiry, but re-sellers are still inclined to make concessions.

ALUMINA SULPHATE is in fair demand on export account, and prices are well maintained.

BLEACHING POWDER is in fair demand for export, without change in value.

COPPER SULPHATE is in fair enquiry, but very little business is being transacted. The present position of the exchanges naturally militates against business. Value is fairly well maintained.

FORMALDEHYDE is an easy market, and very little trade is passing.

IRON SULPHATE is rather slow of sale at last quoted figures.

LEAD SALTS are in fair inquiry, and values now seem to be more stabilised. With any increase in the demand prices should react.

MAGNESIUM SALTS are slow of sale, and sellers are inclined to make concessions to secure business.

POTASSIUM BICHROMATE is in quiet demand even at the present attractive value. Quite a fair business seems to have been done on next year's account.

POTASSIUM CARBONATE is a weak market, with very little business passing.

POTASSIUM NITRATE is well maintained in value, but business is only moderate.

POTASSIUM PERMANGANATE is slow of sale, and the price is inclined to be easier.

POTASSIUM PRUSSIATE is without change in value, and stocks appear to be moving off quite satisfactorily.

SODIUM ACETATE is in better demand, especially on export account, and price is fully maintained.

SODIUM BICHROMATE is an active market for forward position, but prices weaker for prompt.

SODIUM CAUSTIC.—The market is inclined to be easier owing to the absence of export demand.

SODIUM HYPOSULPHITE is in active demand and prices are maintained.

SODIUM NITRITE is only in small inquiry, and the price remains easy.

SODIUM PHOSPHATE is slow of sale, and value is slightly lower.

SODIUM PRUSSIATE is firm, with only small business passing.

SODIUM SULPHIDE is in moderate demand on export account, and values are unaltered.

TIN SALTS are lifeless and values inclined to sag.

ZINC SALTS are in extremely moderate demand with appreciable change in values.

Coal Tar Intermediates

There is very little change to report in the position, but it is surprising to note how well values generally keep up with the present light demand.

BETANAPHTHOL appears to have found its level for the time being, and small business is reported.

DIMETHYLANILINE is in moderate demand at last quoted figures.

DIPHENYLAMINE has been inquired for, and values are well maintained.

RESORCIN is easier, but, on the other hand, quite a fair business is reported.

PARANITRANILINE is quiet, but on the whole the value is well maintained.

SALICYLIC ACID.—Some small business is reported at last quoted values which can only be described as extremely moderate.

Coal Tar Products

The market is quiet generally, and there is little fresh business moving.

BENZOL, 90 PER CENT.—Is slightly easier, being worth 3s. 7d. to 3s. 8d. in the North and 3s. 9d. to 3s. 10d. in the South.

PURE BENZOL remains steady in the region of 4s.

CREOSOTE OIL is also steady, being worth 1s. 2d. on rails in the North and 1s. 3d. in the South.

CRESYLIC ACID remains unchanged at 3s. 11d. for the 95/97 per cent. quality and 4s. 6d. for Pale 97/99 per cent.

SOLVENT NAPHTHA is weak at 2s. 10d. to 3s. on rails.

HEAVY NAPHTHA is worth 3s. to 3s. 2d.

NAPHTHALENE is inactive, Crude qualities being worth from £10 to £23 per ton, and Refined from £35 to £40.

PITCH.—The market is decidedly dull, but makers show no disposition to reduce prices.

Sulphate of Ammonia

The market is quiet, but there is no change in prices.

Current Prices

Chemicals

	per	£	s	d.		£	s.	d.
Acetic anhydride	lb.	0	3	0	to	0	3	6
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	115	0	0	to	120	0	0
Acid, Acetic, glacial, 99-100%	ton	97	0	0	to	100	0	0
Acetic, 80% pure	ton	67	10	0	to	70	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	0	10½	to	0	0	11
Citric	lb.	0	3	0	to	0	3	3
Formic, 80%	ton	115	0	0	to	120	0	0
Gallic, pure	lb.		7	3	to	0	7	6
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	58	0	0	to	60	0	0
Lactic, 60 vol.	ton	67	10	0	to	70	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	1	7	to	0	1	8
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	1	10	to	0	2	0
Salicylic, B.P.	lb.	0	2	3	to	0	2	6
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	2	4	to	0	2	6
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	70	0	0	to	72	10	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0

	per	£	s.	d.		£	s.	d.
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	7½	to		—	
Ammonia, chloride	ton	95	0	0	to	100	0	0
Ammonia, muriate (galvanisers)	ton	60	0	0	to	65	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	80	0	0	to	82	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	26	0	0	to	27	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	8
Bleaching powder, 35-37%	ton	30	0	0	to	31	0	0
Borax crystals	ton	41	0	0	to	42	10	0
Calcium acetate, Brown	ton	19	0	0	to	20	0	0
,, Grey	ton	29	0	0	to	30	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	75	0	0	to	80	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	1	0	0	to	1	0	6
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	42	0	0	to	44	0	0
Cream Tartar, 98-100%	ton	220	0	0	to	225	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	200	0	0	to	205	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	70	10	0	to	72	10	0
Carbonate (White Lead)	ton	61	0	0	to	63	0	0
Nitrate	ton	62	10	0	to	65	0	0
Litharge	ton	57	0	0	to	59	0	0
Lithopone, 30%	ton	45	0	0	to	47	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to		—	
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	1	5	to	0	1	6
Carbonate, 90%	ton	100	0	0	to	105	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8½	to	0	0	9½
Meta bisulphite, 50-52%	ton	215	0	0	to	225	0	0
Nitrate, refined	ton	65	0	0	to	67	0	0
Permanganate	lb.	0	3	3	to	0	3	6
Prussiate, red	lb.	0	3	9	to	0	4	0
Prussiate, yellow	lb.	0	1	10	to	0	2	0
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	10	0	to		—	
Seconds	cwt.	5	5	0	to		—	
Sodium acetate	ton	47	0	0	to	49	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	1	0	to	0	1	1
Bisulphite, 60-62%	ton	42	10	0	to	45	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	30	0	0	to	31	0	0
Caustic, 76%	ton	31	0	0	to	32	0	0
Hydrosulphite, powder, 85%	lb.	0	4	6	to	0	4	10
Hyposulphite, commercial	ton	32	10	0	to	35	0	0
Nitrite, 96-98%	ton	72	0	0	to	75	0	0
Phosphate, crystal	ton	39	0	0	to	40	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	2½	to	0	1	3½
Sulphide, crystals	ton	25	0	0	to	27	10	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst	ton	17	10	0	to	18	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	10	to	0	3	0
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	56	0	0	to	57	0	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21				23	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	9	to	0	6	0
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	3	0	to	0	3	3
Benzoate of soda	lb.	0	3	3	to	0	3	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	10	0	to	0	11	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	14	0	to	0	14	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthaline	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	7	6	to	0	7	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	3	to	0	8	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
R. Salt, 100% basis	lb.	0	4	0	to	0	4	3
Resorcin, technical	lb.	0	7	6	to	0	8	6
Resorcin, pure	lb.	0	14	6	to	0	15	0
Salol	lb.	0	3	9	to	0	4	6
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Cardiff By-Products Market

Sulphate of Ammonia—	
For home consumption (per ton o.t.)	£25 net d.d.
For export (per ton f.o.b.)	£30 to £40
Benzol, 90's (per gallon)	3s. 5d. to 3s. 10d.
Benzol, 50's (per gallon)	3s. 5d.
Solvent Naphtha (per gallon)	3s. 4d. to 3s. 6d.
Heavy Naphtha (per gallon)	3s. 3d. to 3s. 4½d.
Crude Naphthalene Salts (per ton)	£16 to £26
Pitch (per ton)	200s. to 230s.
Creosote (per gallon)	1s. 2d. to 1s. 4d.
Motor Benzol (per gallon)	3s. 5d. to 3s. 10d.
Crude Benzol (per gallon)	1s. 9d.
Toluol (per gallon)	4s.

Company News

LONDON NITRATE.—For the year ended June 30 a dividend of 1s. 6d. per share, payable free of tax on December 1, has been declared.

BENZOL & BY-PRODUCTS.—The directors of Benzol & By-Products, Ltd., announce that they have decided to adopt August 31, the date on which the 10 per cent. cumulative convertible preference shares are calculated to, as the end of the company's financial year. The results of the seven months' trading, they state, are likely to be considerably in excess of the amount needed to pay the preference dividend for the full year. Rear-Admiral P. W. Dumas, late Secretary of the Royal Fuel Commission, has joined the board.

BRITISH COTTON & WOOL DYERS.—Profits for the half-year ended September 30, including income from investments, &c., and after charging administration expenses, £3,774 for specific depreciation, and £75,124 for repairs and renewals, and providing an estimated amount in respect of income tax, corporation tax, and excess profits duty at 60 per cent., and other contingencies, amounted to £76,056. Interest on debenture stock to September 30 absorbed £12,400; amount transferred to depreciation fund, £12,500; leaving a profit of £50,125 for the period. The amount brought forward was £33,753, leaving a credit balance of £83,878.

LEVER BROTHERS.—Although the whole of the four and half million 20 per cent. cumulative preferred ordinary shares (of 5s. each) of Lever Brothers was not subscribed, half of the total was underwritten, and more than 2,250,000 shares were subscribed for. A feature of the issue was the very large number of small amounts subscribed, the number of applications being well in excess of 8,000. It is understood that the number of shareholders in Lever Brothers is 150,000. The existing 20 per cent. preferred ordinary shares, which carry about five months' accrued dividend, were dealt in on November 19 at 11s. 7½d. and 11s. 6d.

ROSARIO NITRATE.—At an extraordinary general meeting held on November 17, a resolution was considered for the division of the existing £5 shares into five fully-paid-up registered shares of £1. Mr. T. V. Anthony, who presided, said the directors had been urged to convert the £5 shares into shares of £1 each. The board had decided previously not to issue further share warrants to bearer, as the directors had found that the disadvantages arising from the existence of those shares outweighed any possible advantages there might have been consequent upon their creation in the first instance. It was necessary for the holders of share warrants to accept the situation that it was not possible to proceed with the conversion and retain share warrants to bearer. The resolution was carried.

UNITED BRITISH OILFIELDS OF TRINIDAD.—The issued capital now stands at £1,250,000. As from January 1, 1919, the Company has owned the whole of the share capital of the United British West Indies Petroleum Syndicate. The result of thus acquiring the control of further territories, refining plant, &c., and of the reorganisation is shown in the elimination of loans from the balance-sheet and a reduction of the adverse balance from £36,173 to £23,101. The sum of £42,626 is credited in the profit-and-loss account as dividend receivable from the United British West Indies Petroleum Syndicate. The sum of £10,294 has been written off against abandoned and unproductive wells and £10,000 on account of depreciation of other assets. The company's operations so far have not given results sufficient for the purpose of providing depreciation of the cost of the properties originally acquired from Trinidad Oilfields, Ltd. The directors have decided to make an issue of £250,000 shares of £1 each at par, offering shareholders one share for every five at present held.

BRITON FERRY CHEMICAL & MANURE.—The directors are offering to shareholders 57,528 ordinary shares of £1 each at a guinea, and 25,407 7 per cent. cumulative preference shares of £1 each at par. The preference shares rank both as regards capital and dividend in priority to the ordinary shares, and have a vote for every five shares. Satisfactory arrangements have been made, according to a statement by the directors, for marketing the whole of the product of the fertiliser plant for 1921. The new shares are offered to holders registered November 6, the ordinary in the proportion of one new ordinary for every four shares held or part of four (whether ordinary or preference), and the preference in the proportion of one new preference for every nine shares held or part of nine (whether ordinary or preference). Applications must be made for both ordinary and preference shares in these proportions. Applications for ordinary shares only or for preference shares only will not be entertained. Applications should be sent, with cheque for the amount payable on application, to Lloyds Bank, 72, Lombard Street, E.C.3, on or before November 17 next, on which date the lists will be closed.

ANGLO-UNITED OILFIELDS.—Sir Trevredyn R. Wynne presided over the first ordinary general meeting of the Anglo-United Oilfields, Ltd., on November 19. In the course of his address he said it was not proposed to submit accounts, as they had not completed a full year in the production of oil. He considered their affairs were in a satisfactory condition. For the six months April till September profits were close on $40,000, without deducting depreciation and taxation. That figure was based on the actual amounts received from Riverton Refinery, to whom the company had sold its oil on hand. When they first commenced producing oil in April they made a contract with the Riverton Refinery Company for the sale to them of 60,000 barrels at a price 40 per cent. above that ruling when the company was formed. A new contract had been arranged on a higher basis as from September 1, 1920. The new price would be still further increased under a sliding scale as soon as their deliveries of oil increased in tonnage, From September 1, therefore, said the chairman, they were receiving a minimum of 60 per cent. over and above the price per barrel a year ago, with the certainty of a further rise as they increased their output, and should the market of Oklohoma oil rise. The meeting was adjourned to a date to be fixed by the directors, when the accounts for the period ending December 31, 1920, would be ready to be submitted to the shareholders. At an extraordinary general meeting it was unanimously resolved that the capital of the company should be increased to £350,000.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Hungary ...	Manures	685
Persia ...	Glass	695
United States of America	Jute textiles	698
Canada ...	Edible corn starch in jute bags. Replies to the Canadian Government Trade Commissioner's Office, Portland House, 73, Basinghall Street, London, E.C.2.	
Montreal ...	Synthetic oils; colours	—
Lyons ...	Chemical products for dyeing, tanning, bleaching	—
Marseilles ...	Chemicals; drugs	—
Gothenburg ...	Heavy chemicals for the paper, pulp, glass and textile trades	—
Zurich ...	Pharmaceutical chemicals ...	—
Vienna ...	Heavy chemicals	—
Panama City	Drugs	—
Kenya Colony	Paints; oils	—

Edward Packard & Co., Ltd., of Ipswich, and James Fison & Sons, Ltd., of Thetford, manufacturers of fertilisers, have amalgamated under the name of Packard & James Fison (Thetford), Ltd., with offices at Ipswich. We are asked to point out that Joseph Fison & Co., Ltd., of Ipswich, are not connected with this amalgamation.

Solving the Transport Problem

Enthusiastic Welcome to the "Transport World."

A FORTNIGHT ago we announced the publication on 5th January of a new weekly paper to be called the *Transport World*, having as its main object the solution of the problem of the return load. We do not remember any journalistic announcement which has been received with greater enthusiasm. The offices of Benn Brothers, Ltd., have been besieged with enquiries, and the traders of the country have never expressed in a more definite form their approval and support of a publishing enterprise. The idea of a motor freight exchange in the form of a weekly journal, has caught and gripped the attention of not only the big but the small people in trade and industry, and it is therefore possible even at this early stage to claim success for this new enterprise.

The announcement this week of the big surplus which the Government have secured from the increase in railway rates may be very satisfactory from the point of view of the Chancellor of the Exchequer, but to the trader it is merely proof of the millions that have been added to the already excessive burdens upon industry in the form of extra railway charges. Whether railway rates had increased or not, the road transport industry would, of course, have gone ahead, but the outlook for road transport since railway costs became so prohibitive has brightened and widened, and the *Transport World* comes upon the scene at the very moment when the motor industry has determined to assume the leading position as providers of transport for the service of the community.

So many of our readers have written to Benn Brothers, Ltd., for particulars of the motor freight exchange, that it may save others trouble if we give rather more details than was possible in our article of a fortnight ago. It may be said at once that the motor freight exchange section of the *Transport World* will be useless to those who are not able to plan their journeys and their transport requirements at least a few days ahead. The *Transport World* will give each week,, complete and comprehensive lists of owners of freight, requiring transport and of transport owners requiring freight. Both these lists will be published under towns in alphabetical order, and both will give such essential details as tonnage or capacity of vehicles. Thus, if a trader has a load of goods to transport from Brighton to Chatham, his requirements will appear under the heading "Transport Wanted," as follows :—

Brighton-Chatham, 3 ton 6 cwt. January 15.—BRADSHAW. Tel. 293, Brighton. T.A.: "Brad., Brighton."

This advertisement will be seen by haulage contractors and motor owners both in Brighton and Chatham, and also in neighbouring districts. It is to be presumed that among them will be found a motor owner who, on or about the date given, is engaged to cart goods from Chatham to Brighton, or, at all events, along part of that road. The transport owner will proceed to get into touch with Bradshaw of Brighton, and a bargain which should save money to both would promptly be made. Similar information will be given with regard to "Freight Wanted," published in the same way, alphabetically by town.

In addition to these two sections, there will be a directory of road carriers appearing each week with their telegraphic addresses, and in these three ways it is obvious that the facilities for arranging road transport will be much greater after January 5th than they are to-day. It is particularly pleasing to know that the *Transport World* has found its most enthusiastic welcome among those who are interested in the various freight exchanges which are now being established all over the country. Motor owners who have already come together in this way recognise in the new journals a powerful support which should much improve their chances of successful organisation.

Board of Trade and Proposed Dyestuffs Conference

IN reply to a proposal by the Chemical and Dyestuff Traders' Association, that the Board of Trade should convene a national conference to consider the dyestuffs problem in all its bearings, Sir Robert Horne has written stating that he is of the opinion that at the present time no useful purpose would be served by convening a joint conference of manufacturers, distributors, and users, to discuss the projected legislation in connection with the dyestuffs industry in this country.

A Journalistic Amalgamation

IT is announced that starting with next week, *Ways & Means* and *Common Sense* will be amalgamated. *Common Sense* was first published four years ago, by Mr. F. W. Hirst, when he relinquished the editorship of the *Economist*. In its columns, week by week, and through the League to Enforce Public Economy, for which Mr. Hirst is also responsible, he has consistently impressed upon the public the evils of Government extravagance. *Ways & Means* was the direct outcome of the work of Mr. Ernest Benn, in the founding of Whitley Councils, and the bringing together of employers and employed, through the Industrial Reconstruction Council, of which he was the creator. *Ways & Means* has acted as a leader of progressive industrial thought, and while consistently advocating co-operation between employers and employed, it has always been an unbending enemy of Government trading and official interference in trade. The policies of the two papers have so much in common that an amalgamation comes quite naturally, and the added strength arising from the union will enable Mr. Benn and Mr. Hirst to carry on with still better effect the work which they have set themselves to do.

Chemical Agent's Affairs

CREDITORS interested in the recent failure of Richard Modern, Commercial Agent in the provision and chemical trades, Tregunter Road, S. Kensington, who filed his own petition on November 2, met at the London Bankruptcy Court on November 16.

Mr. Vyvyan, the assistant Receiver, who presided, reported that the statements of account filed under the proceedings disclosed total liabilities £2,023. 6s. 5d., of which £968. 15s. 4d. were scheduled as unsecured assets estimated to produce £950.

In September, 1919, debtor formed the Anglo-Argentine Export & Import Company, Ltd., with registered offices at 10, Philpot Lane, E.C., and a capital of £2,000 in £1 shares, of which only two were issued. As vendor he was to have received 800, but they were never allotted. He was appointed managing director and found the working capital £400 by means of a Bill of Sale over his furniture. No business was done by the company, and in March, 1920, further money being required, a further loan was raised on his furniture which was now subject to a Bill of Sale for £1,100. In the following May the winding-up order was made against the company, and its affairs were now being liquidated by the Official Receiver. In the June he went to Germany to endeavour to complete a contract for 53 tons of anthracene, an intermediate for the manufacture of dyes. The anthracene had been purchased and sold by the company, but owing to the failure of the company, the contract could not be completed as it required financing to the extent of £20,000. For the purposes of the journey to Germany he borrowed £200 from a lady under an agreement that she should have 50 per cent. of the profits. He secured the option on the anthracene, returned to London, and sold the goods to the original purchaser with a guarantee that it was of 95 per cent. strength. Before leaving Germany he instructed a public analyst to obtain samples, analyse them and report as speedily as possible. He received the report in due course and it showed only 85 per cent. strength, and his purchasers as a consequence turned the deal down. The lady from whom he borrowed the £200 brought an action for its recovery which he did not defend. Judgment was obtained and execution being threatened, he filed his petition.

Asked as to whether he had any offer to make the debtor said that he hoped with the assistance of his son, who was in the Argentine, to be able to lodge a proposal for a composition. He further pointed out that he had a friend who was prepared to purchase the lease of his house together with his furniture for £2,000, and that if the property could be sold for that amount and the Bill of Sale on the furniture paid off there would be sufficient balance to pay all his creditors.

In the result the creditors agreed to allow the meeting to be adjourned for a week to enable the debtor to see if he could bring in a proposal for a composition.

The meeting was accordingly adjourned.

Quebec mines shipped 53,965 tons of copper and sulphur ore during 1919.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Notice of Dividend

BALL, PERCY FIELDING (carrying on business under the style of John Ralph & Co.), Green Bank, Trimmingham, Halifax, Yorkshire, and carrying on business at Mearclough Mills, Sowerby Bridge, Yorks, and 41, Corporation Street, Manchester, drysalter and oil merchant, 6½d. supplemental. November 29, 1920. Official Receiver's Office, 12, Duke Street, Bradford.

Application for Discharge

HEESCH, ERNEST ERWIN FERDINAND, lately residing at 158, Woodsley Road, and formerly carrying on business at 212, Wellington Street as Manufacturers' Agent, now residing at 59, Clarendon Road, and carrying on business at Stansfield Mill Yard, 77 and 79, Kirkstall Road, all in the city of Leeds, as oxy-acetylene welder and chemical manufacturer under the style of the Gatap Company. December 13, 1920. 10.30 a.m. County Court House, Albion Place, Leeds.

Companies Winding Up Voluntarily

ELECTRO-CHEMICAL DEVELOPMENTS, LTD. (in voluntary liquidation).—E. A. Ashcroft, Liquidator. All creditors will be paid in full.

HARTLEPOOLS PULP & PAPER CO., LTD.—N. W. Wild, Broad Street, London, E.C.,2, Liquidator.

NEW BRITISH FUEL SYNDICATE, LTD.—E. G. Lea, 3, Victoria Street, London, S.W., Liquidator.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BAKER, A. J. J., The Broadway, Leigh-on-Sea, chemist. £30 4s. 7d. October 14.

WALKER, W. B., 44, Atlantic Chambers, 7, Brazennose Street, Manchester, chemical merchant. £116 18s. 10d. October 20.

MAJUNGA OILFIELDS OF MADAGASCAR, LTD., 10, New Bond Street, London, W., oil prospectors. £48 19s. 11d. October 19.

MARTIN'S OILFIELDS OF MADAGASCAR (PARENT) CO., LTD., Clifford Chambers, 10, New Bond Street, London, W., oil prospectors. £33 16s. 11d. October 19.

POMEROY, F. T., 5, The Exchange, Thornton Heath, chemist. £19 12s. 6d. October 12.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C. :—

BRITISH AMMONIUM CO., LTD., Crown Chambers, Matlock, Derbyshire. Manufacturing chemists, druggists, &c. Nominal capital, £100,000 in 100,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, one share.

CALLIE & CO. (LIVERPOOL), LTD., 20, North John Street, Liverpool. Welding by oxy-acetylene or other processes, &c. Nominal capital £4,000 in 4,000 shares of £1 each. Directors to be appointed by subs. Qualification of directors, £25.

CALLINGTON OXIDE CO., LTD., Sor[illegible]allington, Cornwall. Manufacturers of zinc oxide. Nominal capital £1,000 in 1,000 shares of £1 each. Directors: H. E. Sewel, R. G. Trevithick, A. H. Blight. Qualification of directors, one share.

F. COATES & CO., LTD., 56, Rawson Street, New Basford, Nottingham. Chemists, druggists. Nominal capital £3,000 in 3,000 shares of £1 each. Directors, F. C. Coates, W. J. Appleby. Qualification of directors, one share.

COLCLOUGH COLOURS, LTD., Cauldon Place Works, Shelton, Stoke-on-Trent. Colour manufacturers, drysalters and chemists. Nominal capital £5,000 in 2,500 preference shares and 2,500 ordinary shares of £1 each. Directors, H. T. Robinson, H. A. Robinson. Qualification of directors, 50 shares.

COMBUSTION DEVELOPMENTS, LTD., 31, St. Mary Axe, E.C.3. To acquire patents relating to burners of liquid fuel. Nominal capital £50,000 in 50,000 shares of £1 each. Directors, Sir R. B. Chadwick, F. S. Askew (permanent directors), D. Wright. Qualification of directors, £100; permanent directors, 5,000 shares.

DOUGLAS ENGINEERING CO., LTD. Chemical, mechanical and general engineers. Nominal capital, £1,500 in 6,000 shares of 5s. each. Directors to be appointed by subscribers. Qualification of directors, one share. Subscribers: A. H. Douglas, F. Minton.

R. W. GREEFF & CO., LTD. Chemical merchants. Nominal capital, £120,000 in 60,000 preference shares and 60,000 shares of £1 each. Directors: A. J. Thompson, E. M. de Greeff, P. Smith, A. E. Munns, C. Lorleberg, A. F. Butler. Remuneration of directors, £200 each.

INSTITUTE OF PHYSICS. The elevation of the profession of physicist and the advancement of a knowledge of physics. Every member to contribute a sum not exceeding £1 if necessary. Directors: R. T. Glazebrook, C. H. Lees, Sir R. A. Hadfield, Bart., C. C. Paterson, and 14 others.

LINELLS, LIMITED, 167, Mary Street, Balsall Heath, Birmingham. Chemists, drysalters, oil and colour merchants. Nominal capital £2,000 in 2,000 shares of £1 each. Directors: H. J. Linell, J. E. Gascoyne. Qualification of directors, one share.

OPHTHALMIC & CHEMISTS' SUPPLY CO., LTD., Ulster Chambers, Regent Street, W. Manufacturers and dealers in chemicals, &c. Nominal capital, £2,000 in 2,000 shares of £1 each. Directors: M. Burns, P. N. Lawson. Qualification of directors, £1.

PAPER-PULP PATENTS CO., LTD., 25, Victoria Street, Westminster, S.W. Manufacturers of paper, paper pulp and cellulose. Nominal capital, £10,000 in 10,000 shares of £1 each. Directors to be appointed by subscribers.

POWER SPIRITS, LTD., Parkfield Works, Stockton-on-Tees. To manufacture combustible spirits, oils and gases. Nominal capital, £30,000 in 6,000 ordinary shares of £5 each. Minimum subscription, seven shares. Directors: E. L. Pease, R. Armitage, A. H. Lymn, W. Beswick, G. C. Clayton, H. Langwell. Qualification of directors, one share.

ROBERTSHAW, HENRY, LTD., 151, Railway Street, Nelson, Lancaster. Chemists and druggists. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: H. Emmott, H. Robertshaw, A. Clarkson. Qualification of directors, one share.

Castor Oil Case

MR. JUSTICE SUNBURY heard a case in the King's Bench Division on Tuesday in which Marie Isabelle Baroness Gudin sued Hector Edward Arthur Digby for the return of £500 which she alleged was advanced by her to defendant to start a castor oil plantation in Jamaica. Plaintiff is 80 years of age. Before investing the money she obtained a promise from Mr. Digby that if her godson Commander Rowland Bourke, V.C., disapproved of the scheme, the money should be returned. Commander Bourke, for whose benefit the plaintiff paid the money, returned to England a fortnight later and after having the scheme explained to him by defendant, expressed strong disapproval. The plaintiff asked for the return of the money. The case was adjourned.

GLASSWARE FOR STEEL ANALYSIS

DURO GLASS R LONDON

For use in Steelworks, Resistance to Hydrochloric Acid is essential—— Duroglass vessels bearing the above device are British-made and have

FOUR & A HALF TIMES

more power of Resistance to either Boiling Hydrochloric Acid or its vapour than has Jena Glass:—see the Journal Soc. Glass Technology. I. 183

Wholesale only from DUROGLASS LTD 92 Fore St. London. E.C.: Retail from dealers everywhere.

Chemical Dealer in Bankruptcy

ON Tuesday last the adjourned first meeting of the creditors of Richard Modern, Commission Agent dealing in Provisions and Chemicals, 31, Tregunter Road, Kensington, was held at the London Bankruptcy Court. Mr. Vyvyan, the Official Receiver, presiding.

The statement of affairs filed in the proceedings disclosed liabilities £2,123 6s. 8d., of which £968 15s. 4d. ranks for dividends and assets estimated to produce £950. On the last occasion the meeting was adjourned to enable the debtor to see whether he could realise his furniture and lease of his house for which he then stated he had an offer for a sum of over £2,000, which would enable the existing Bill of Sale of £1,004 to be paid off, and leave sufficient to pay everyone in full. The debtor now said that he had been unable to realise the property as he had not had sufficient time, but he thought that with further time he could do so.

The Chairman thought under the circumstances the best thing would be to pass resolutions for the adjudication of the debtor bankrupt, and then the debtor could bring in a proposal at any time he found himself able to do so.

This was agreed to by the creditors present, and the resolution having been passed the Chairman said that the Official Receiver would remain trustee of the estate, and would realise the assets to the best advantage, and he thought there was a good chance of their realising sufficient to pay the debtors in full.

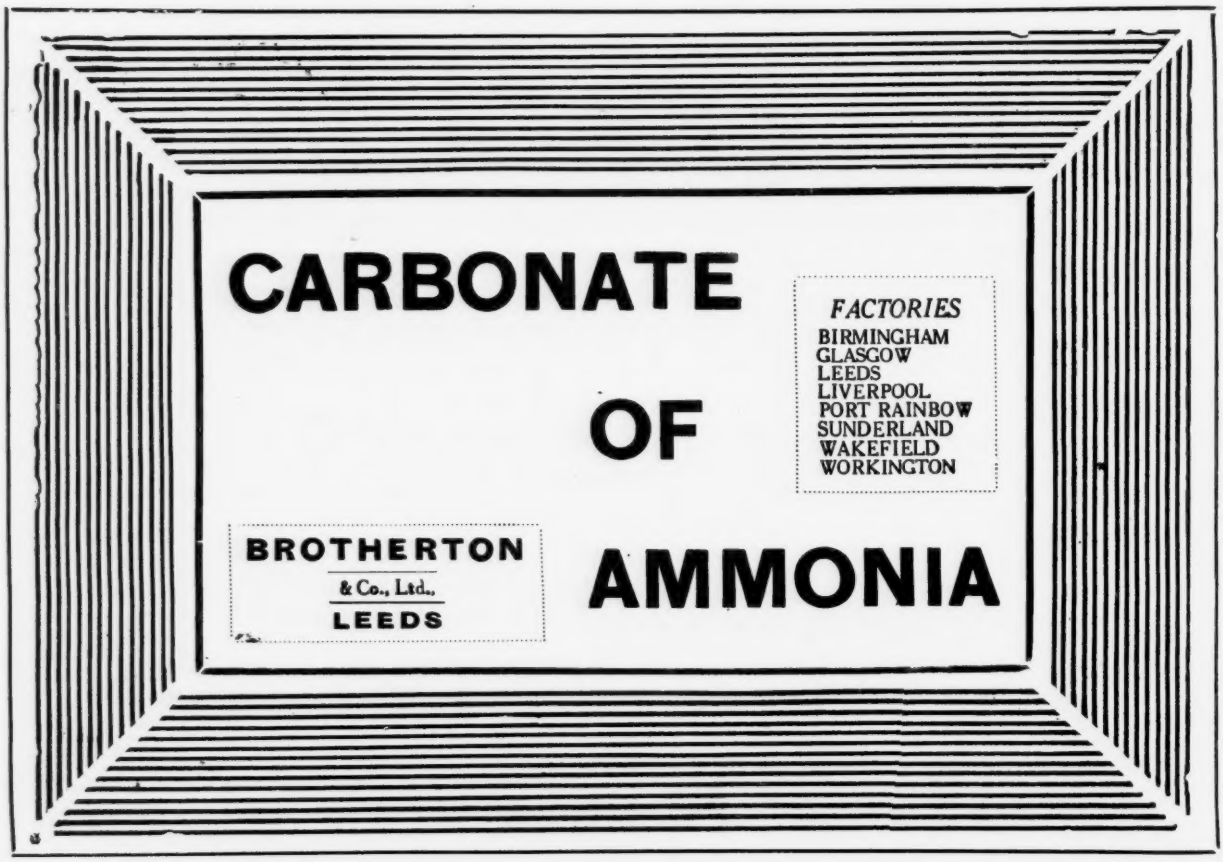
The meeting then dispersed.

At an inquest at Walsall on Thursday, November 18, a verdict of "accidental death" was returned with regard to the death of Ernest Simpkins, which occurred at Brownhill's Chemical Works. Death was caused by gas which found its way into an empty still which Simpkins was helping to clean, from a still which was at work.

Italian Chemical Output

WHEN the demand for munitions ceased in Italy, no time was lost in converting factories to a peace footing, upon which they could serve industry. At Ferrandia, for example, a smokeless powder plant has been converted to manufacture celluloid, photographic films, artificial leather and other products, and success has followed the effort. Another large dye plant at Rho is producing about 250 dyes. These and many other works are controlled by the Societa Italiana Prodotti Esplodenti, which employs over 90 chemists and an army of workers, and is managed by Ing. Ferdinando Quartieri, to whom the Italian dye and chemical industry owes a great debt. Coal supplies, obviously, are vital to the work and its scientific development, and our attention thereto will strengthen commercial relationships.

Selecting Microscope Stands

MANY patterns on the market at the present time are useful for amature work and are often noted as being fitted with a good course and fine adjustment, but when used for high powers will not give satisfactory results on account of vibration, due to imperfect design. Too much time is spent in manipulating the various motions which detract from the efficiency of the instrument. The chief consideration is to have a heavy and rigid stand occupying little space, and with simple rack course adjustment and a sensitive smooth working fine, without tendency to vibration, so essential to laboratory and bacteriological research. Mr. C. E. Mackett, optical specialist of Tunbridge Wells, points out that the Horseshoe Pattern Stand allows a free range of use of the substage, especially when wanted for photo-micrography, it also has the advantage of being easily clamped to a bench.

Mr. Clinton Frederick Chance, of Chance & Hunt, Ltd., chemical manufacturers, Oldbury, has resigned from the Birmingham City Council owing to ill-health.